Health and Clean Air Newsletter

Fall--2001

Asthma Development

Footnote 1:
Office of Children's Health Protection, U.S. Environmental Protection Agency, "Asthma and Upper Respiratory Illnesses," http://www.epa.gov/children/asthma.htm

Footnote 2:
FRIEDMAN, M.S., POWELL, K.E., HUTWAGNER, L., GRAHAM, L.M., TEAGUE, G. Impact of Changes in Transportation and Commuting Behaviors During the 1996 Summer Olympic Games in Atlanta on Air Quality and Childhood Asthma, JAMA 285:897-905; 2001.

Footnote 3:
R. MCCONNELL, K. BERHANE, F. GILLILAND, T. ISLAM, S.J. LONDON, W.J. GAUDERMAN, E. AVOL, H.G. MARGOLIS, J.M. PETERS Sports And Asthma In Children Exposed To Ozone, 2001 Meeting of the American Thoracic Society.

Abstract:
Air pollution is thought to exacerbate but not to cause asthma. However, the effects of interactions between exercise and air pollution have not been evaluated. We examined the relationship between newly diagnosed asthma and participation in team sports among a cohort of children exposed to different levels and mixtures of air pollutants in 12 communities in Southern California. Of 3535 children with no lifetime history of physician diagnosed asthma, and who were followed for up to 5 years, a total of 265 children reported a new physician diagnosis of asthma during the follow-up period. Using Cox proportional hazards models, the risk of asthma among children playing 0, 1, 2, or 3 or more team sports at entry into the study was examined in the 6 communities with high ozone concentrations (4 year average 10 a.m. to 6 p.m. mean 59.6 parts per billion (ppb); standard deviation (s.d.) 5.3), and in the 6 communities with lower average ozone concentrations (mean 40.0 ppb; s.d. 7.9). Within communities with high ozone, the relative risk (R.R.) for newly diagnosed asthma among children playing 3 or more sports was 3.31 (95% confidence interval (C.I.) 1.89-5.81), compared with children playing no sports. There was no effect in low ozone communities (RR 0.79; C.I. 0.38-1.63), and there was a significant interaction between total number of sports played and residence in a high ozone community. In high ozone communities, the effect of playing 3 or more sports was larger in participants who had no lifetime history of wheeze at entry into the study (R.R. 4.43) than among children with a history of wheeze (R.R. 2.65). We conclude that the incidence of new asthma diagnosis is associated with heavy exercise in communities with high levels of ambient ozone and that under these conditions ozone may cause asthma.

Footnote 4:
McDONNELL, W.F., ABBEY, D.E., NISHINO, N., & LEBOWITZ, M.D.
Long-term ambient ozone concentration and the incidence of asthma in nonsmoking adults: the AHSMOG study.
Environmental Research Section A 80, 110-121 (1999).

Abstract:
Cohort of 3091 nonsmokers aged 27-87 years followed for a 15-year period in California. 3.2% (n=54) of males and 4.3% (n=83) of females reported new doctor-diagnosed asthma. In males, 20-year mean 8-hour average ambient ozone concentration was significantly associated with a RR of 2.09 for a 27 ppb increase in ozone exposure. No such relationship in females was found. A history of "ever smoking" in men and of working with a smoker in women were also risk factors. History of childhood pneumonia or bronchitis was also a risk factor. Relationship to ozone not affected by addition of other pollutants (PM, SO4, NO2, and SO2). Ozone 8-hour averages varied from 5 ppb to 75 ppb in the whole sample. Data also indicate "a positive association between ozone concentration and development or redevelopment of asthma symptoms in those who reported a doctor's diagnosis, but no current symptoms, of asthma in 1977." Interesting analysis.

Footnote 5:
GOREN, A., HELLMANN, S., GABBAY, Y., & BRENNER, S.
Respiratory problems associated with exposure to airborne particles in the community.
Arch Environ Health 54; 165-171, 1999.
Abstract:
Rural area of Israel; one unpolluted and the other exposed to pollution from a cement factory and quarries. 638 children aged 7-13 in polluted community compared to 338 in clean community. Map of location of school, cement factory and quarry in polluted region. Graph of TSP and PM10 has erroneous ordinate, but peaks of PM10 might have exceeded 300 micrograms/m3. PM10 level of 150 micrograms/m3 said to be violated very often in polluted region. No particle analysis. Children in polluted region had: more respiratory symptoms, more cough, and more cough accompanied by sputum. Asthma also more prevalent. No differences in PFT's, but PEFR was lower in children in polluted region.

Footnote 6:
HAJAT, S., HAINES, A., GOUBET, S.A., ATKINSON, R.W., & ANDERSON, H.R.
Association of air pollution with daily GP consultations for asthma and other lower respiratory conditions in London.
Thorax 54; 597-605; 1999.
Abstract:
Time series analysis. Between 268,718 and 295,740 registered patients in London using 45-47 practices contributing to the General Practice Research database during 1992-4. Associations found with NO2, CO, and PM10 (PM = particulate matter) for asthma in children. In summer, for a 10th-90th percentile increase in NO2 lagged by one day, asthma consultations increased 13.2% with NO2, 11.4% with CO, and 9.0% with SO2. In winter for lower respiratory disease, these percentages became NO2 7.2%; CO 6.2%; and SO2 5.8%. Negative associations with ozone noted. In adults, only consistent association was with PM10 (increase of 9.2%). Detailed air pollution data for different seasons. Correlation between SO2 and NO2 about 0.6 year round, and about the same between PM10 and SO2. Correlation coefficient between PM10 and NO2 was 0.73 all year; 0.78 in summer; and 0.69 in winter. Significant associations also noted for pollutants and consultations for patients over the age of 65. In summer for NO2, the increase was 20% for asthma for the percentile gap. Notes that results are likely to be underestimates.

Footnote 7:

WANG, T-N., KO, Y-C., CHAO, Y-Y., HUANG, C-C., & LIN, R-S.
Association between indoor and outdoor air pollution and adolescent asthma from 1995 to 1996 in Taiwan.

Environ Research Section A 81; 239-247.

Abstract:
Survey of 165,173 high school students aged 11-16 in two communities in Taiwan. ISAAC questionnaire used. Asthma defined as positive answer to any of the questions 1 to 5 in that questionnaire in the video program. Kaohsiung City and County had some more heavily polluted regions, and some cleaner. Annual means of CO (0.60 to 1.49 ppm), NO2 (0.001 to 0.034 ppm), PM10 (19.4 to 112.81 micrograms/m3), SO2 (0 to 0.023 ppm) and O3 (0.002 to 0.031 ppm). TSP varied from 112 to 237 micrograms/m3 as annual mean. Correction for ETS conducted. Prevalence slightly higher if ETS reported. Asthma prevalence varied round 13%. In case of PM10 for example, prevalence was 15.3 with values below 80, and 14.6 with values above. In the case of SO2, value was 14.46 in areas with SO2 less than 0.03 ppm, and 15.08 in areas where it was above this. NO2 below 0.028 prevalence was 13.47, and if above this was 15.23. Asthma prevalence also varied with CO and with TSP (which was a better indicator than PM10). Authors conclude: "We observed a statistically significant association between outdoor air pollution and asthma, after controlling for potential confound variables". Models with TSP, NO2, CO, O3, and airborne dust were all significant, whereas PM10 and SO2 were not. Note that asthma prevalence was increased by as much as 29% by the major outdoor pollutants.

Footnote 8:
YU, T-S, I., WONG, T.W., WANG, X.R., SONG, H., WONG, S.L., & TANG, J.L.
Adverse effects of low-level air pollution on the respiratory health of schoolchildren in Hong Kong.
J Occup Env Med 43; 310-316; 2001.

Abstract:
Children aged 8-12 in two areas of Hong Kong. 1660 children completed respiratory questionnaire, and 1294 had spirometry. Pollution levels:

	High HPD	Low LPD
Boys n =	402	392
Girls n =	446	420
SO2 micrograms/m3	15-45	10-15
ppb	5.7–17.1	3.8–5.7
NO2 micrograms/m3	40-80	35-50
ppb	20.8– 41.6	20.3–29.0
RSP microgram/m3	30-80	20-60

ETS exposure about 40% in all groups. Boys and girls separately analyzed. Not much difference in symptoms but higher prevalence in both in highly polluted districts. Bronchitis not much different, but asthma prevalence higher in HPD. PF, FVC, FEV1, FEF25-75 all lower in HPD–not much difference between boys and girls. Differences between HPD and LPD:

	Boys	Girls
FVC l	- 0.029	- 0.050
FEV1 l	- 0.054	-0.083

MMFR l/sec	- 0.156	- 0.156

Footnote 9:

BALDI, I., TESSIER, J.F., KAUFFMANN, F., JACQMIN-GADDA, H., NEJJARI, C., & SALAMON, R.

Prevalence of asthma and mean levels of air pollution: results from the French PAARC survey.

Eur Respir J 14; 132-138; 1999.

Abstract:

24 areas in 7 towns surveyed in 1974-6 re-analysed. Of 20,310 adults aged 25-59, 6.4% were asthmatics as well as 6.1% of the 3,193 children aged 5-9 years. Geographical correlation found between asthma and mean annual level of SO2 (ranging from 17-85 micrograms/m3) in adults. No relationship in children. After controlling for age, educational level, smoking, and geographical clustering, with a multivariate random effects model, in adults the odds ratio for a 50 microgram/m3 increase in SO2 was 1.24. More than 3 years of residence in the area was a requirement. 13,673 households included. Prevalence of asthma in adults was about 4% when SO2 annual means were less than 30 micrograms/m3, and between 5 & 6% when SO2 was more than 80 micrograms/m3. Authors state that "it is possible that SO2 in the present study is just a sensitive indicator of air pollution."

HOLD THIS ONE FOR CURTIS' DIRECTION

Footnote 10:

VAN DER ZEE, S.C., HOEK, G., BOEZEN, H.M., SCHOUTEN, J.P., VAN WIJNEN, J.H., & BRUNEKREEF, B.

Acute effects of urban air pollution on respiratory health of children with and without chronic respiratory symptoms.

Occup Environ Med 1999: 56: 802-813.

Abstract:

Studies in three consecutive winters starting in 1992. PEFR and daily respiratory symptoms registered daily in panels of children aged 7-11 in areas in the Netherlands with high traffic density. Simultaneously, panels of children in rural areas studied. Daily measurements of PM10, black smoke (BS), SO2, and NO2 performed in all areas. "In children with symptoms from both areas, significant associations were found between PM10, BS, and sulphate concentrations and the prevalence of symptoms of the lower respiratory tract and decrements in PEFR. " Also noted that particle concentrations in the urban areas were associated with increased use of bronchodilators. A 100 microgram/m3 increase in the five day mean PM10 was associated with a twofold increase in the use of bronchodilators, a 50% increase in lower respiratory symptoms, and an 80% increase in decrements of PEFR. Much smaller effects in children without any pre-existing respiratory symptoms.

Numbers of children:

	With Symptoms		Without Symptoms	
	Urban	Rural	Urban	Rural
Winter 1992-3	31	48	43	60
1993-4	55	71	56	77
1994-5	56	59	38	39

Authors also conclude that the use of medication for asthma does not prevent the adverse effects of particulate air pollution. Excellent discussion.

WORTH NOTING *Four subsections, 8 footnotes as indicated.*

Benzene as a Cause of Lymph System Cancer

Footnote 1:

RAASCHOU-NIELSEN, O., HERTEL, O., THOMSEN, B.L., & OLSEN, J.H.
Air Pollution from traffic at the residence of children with cancer.
Am J Epidemiol 2001: 153; 433-443.

Abstract:

1,989 children recorded with cancer at the Danish Cancer Registry. With diagnosis of leukemia, CNS tumors, or malignant lymphoma during 1968-1991 compared with 5,506 control children selected at random. Residential histories traced from 9 months before birth till the time of diagnosis. Information on traffic and configuration of streets collected, and average concentrations of benzene and NO2 (indicators of traffic related air pollution) calculated. Risk of lymphomas (Hodgkin's disease) increased by 25% for a doubling of the calculated concentrations of benzene and NO2. Good discussion of measurements and calculation of traffic exposure from NO2.

Hydrogen Sulfides:
That "Rotten Egg" Smell
Footnote 2:
LEGATOR, M.S., SINGLETON, C.R., MORRIS, D.L., & PHILIPS, D.L.
Health Effects from chronic low-level exposure to Hydrogen Sulfide
Arch Environ Health 56; 123-131; 2001.
Abstract:
Notes previous studies, including one in Rotorua in New Zealand which found an elevated prevalence of eye and CNS disease. Two exposed communities were Odessa in Texas, where contaminated ponds released H2S (3-40 micrograms/m3 or 7-27 ppb as an annual average with an 8-hour maximum of 335-503 ppb or 500-750 micrograms/m3; and Puna in Hawaii where wells for geothermal power have been drilled; here H2S is in the low ppb range, though a single peak of 301 ppb was recorded, and releases in the range of 200-500 ppb have been reported. These communities were compared to Hilo Hawai, Midlothian Texas, and Waxachie in Texas. Selection process for subjects is described in some detail.

Numbers were Odessa = 126; Puna = 97; Midlothian = 58; Waxachie = 54; and Hilo = 58. Interviewer selection and training procedures. Self reported symptom comparisons revealed excess (Odds Ratios) ORs between clean and contaminated communities as follows:

CNS symptoms =	12.7	Cardiovascular =	2.03
Ear/nose/ throat =	7.24	Digestive =	4.05
Respiratory =	11.92	Teeth/gums =	6.31
Muscle/bone =	3.06	Urinary system =	2.48
Skin =	3.6	Blood =	8.07
Immune system =	5.35	Endocrine =	1.06

Of CNS symptoms, fatigue, restlessness, depression, memory loss, balance, difficulty sleeping, anxiety, lethargy, headache, dizziness, and change in senses were noted in between 30-50% of those in contaminated regions compared to 10-25% in clean regions. Respiratory symptoms, wheezing, shortness of breath, persistent cough, bronchitis all between 20-30% in contaminated locations compared to about 5% in clean areas. Anemia and easy bruising twice as common in contaminated locations. Good discussion of interpretation of findings from this kind of survey, and discussion is cautious but generally convincing. This appears to be one of first reputable attempts to establish the reality of chronic symptoms as a consequence of low level H2S exposure. H2S is emitted from sour gas plants, and there have been occasional "blowouts" of considerable magnitude. This is an important problem in Alberta and Texas. Accidental exposures also occur. H2S in high concentration is immediately fatal--understanding of low level exposures has been very limited.

Diesel

Footnote 3:

SALVI, S., BLOMBERG, A., RUDELL, B., KELLY, F., SANDSTROM, T., HOLGATE, S.T., & FREW, A.

Acute inflammatory responses in the airways and peripheral blood after short-term exposure to diesel exhaust inhealthy human volunteers.

Am J Respir Crit Care Med 1999; 159; 702-709.

Abstract:

15 healthy human volunteers exposed to air and diluted diesel exhaust for one hour with intermittent exercise. PM10 inhaled was 300 micrograms/m3; NO2 was 1.6 ppm; NO 4.5 ppm; CO 7.5 ppm; total hydrocarbons 4.3 ppm; formaldehyde 0.26 milligram/m3; suspended particles were 4.3 x 106 cm 3 6 hours after end of exposure, BAL performed. Results showed no effects on lung function; significant increase in neutrophils and B lymphocytes in BAL; together with increases in histamine and fibronectin; Bronchial biopsies showed increases in neutrophils, mast cells, CD4+ and CD8+, and T lymphocytes. Upregulation of endothelial adhesion molecules also found. Neutrophils and platelets increased significantly in peripheral blood following exposure. Authors conclude that "at high ambient concentration, acute short-term diesel exhaust exposure produces a well-defined and marked systemic and pulmonary inflammatory response in healthy human volunteers, which is underestimated by standard lung function measurements". Important data.

Biomass

Footnote 4:

SMITH, K.R., SAMET, J.M., ROMIEU, I., & BRUCE, N.
Indoor air pollution in developing countries and acute lower respiratory infections in children Thorax 2000; 55; 518-532 .

Abstract

Important review article. 116 references. 4.1 million deaths annually from acute respiratory illnesses in children under five in developing countries. This is compared with 3.0 million from intestinal disease, and 0.68 million from malaria. Measured particulate levels indoors recorded in Papua New Guinea, Kenya, India, Nepal, China, and the Gambia. Description of biomass cooking.

Footnote 5:

MISHRA, V.K., RETHERFORD, R.D., & SMITH, K.R.
Biomass cooking fuels and prevalence of tuberculosis in India
Int J Infect Dis 1999; 3; 119-129.

Abstract:

Analysis of 260,162 people aged 20 and over in a Family Health Survey conducted in India in 1992-3. "Results strongly suggest that use of biomass fuels for cooking substantially increases the risk of tuberculosis in India".

Footnote 6:

SORENSEN, B., FUSS, M., BIGLER, W., WIERSMA, S., HOPKINS, R.
Surveillance of Morbidity during wildfires–Central Florida. 1998
MMWR February 5th, 1999/ 48 (04); 78-79.

Abstract:

Fires burned 499,477 acres in Florida in June-July 1998. Data from 8 hospitals were combined and compared to same period in 1997. Emergency visits increased 91% for asthma; 132% for acute bronchitis; and 37% for chest pain. No differences in number of admissions to hospital.

Footnote 7:

DUCLOS, P., SANDERSON, L.M., & LIPSETT, M.
The 1987 Forest Fire Disaster in California: assessment of emergency room visits
Arch Environ Health 45; 53-58; 1990.

Abstract:

Excess of 600,00 acres burned in August 1987 due to lightning strikes. Hospital data compared for two and a half- week period with two reference periods. 40% increase in asthma and 30% increase in COPD visits recorded. Visits for sinusitis, upper respiratory infections, and laryngitis also occurred.

Footnote 8:

LONG, W., TATE, R.B., NEWMAN, W., MANFREDA, J., BECKER, A.B., & ANTHONISEN, N.R.
Respiratory symptoms in a susceptible population due to burning of agricultural residue
Chest 113; 351-357; 1998.

Abstract:

428 participants in ongoing lung health study (35-64 years old) with mild to moderate airways obstruction (FEV1 %P was 73%). High level of airways hyper-responsiveness (23% of men and 37% of women). Episode of smoke in Winnipeg in 1992 due to burning of agricultural residue between Sept 25 and Oct 15, 1992. Survey showed that of 265 men, 16% reported breathing trouble due to the smoke, and of 163 women, 98% reported breathing trouble. Main symptoms included more cough, more wheeze, more chest tightness, more shortness of breath, and 37% of men and 49% of women reported some of these symptoms. 10% of men and 23% of women reported that they had been woken up by these symptoms. 3% of men and 6% of women reported increased drug use. Eye irritation was reported only by those with hay fever. Note that heating was on and houses were relatively closed at this time, and this may have reduced impact. PM10 exceeded 110 micrograms/m3; TSP exceeded 200 micrograms/m3. When PM10 was > 80 micrograms/m3, relative risk of COPD hospital admissions increased. 31 references.

<u>The Scale of the Threat</u> *Place at end of section, do not footnote, but activate links.*
(Asthma Box)

Sources:
World Health Organization, " Bronchial Asthma," WHO Fact Sheet No. 206 (January, 2000),
http://www.who.int/inf_fs/en/fact206.html

Centers for Disease Control, U.S. Department of Health and Human Services, "Asthma Rates in U.S. Increase," April 24, 1998,
http://www.cdc.gov/od/oc/media/pressrel/r980424.htm.

Richard Kreutzer, Michael Lipsett, Julie Von Behren, and Eileen Yamada, "Asthma in California: Laying the Foundation for a Statewide Strategy," California Policy Seminar Brief Series (August 1998),
http://www.ucop.edu/cprc/asthma.html.