Adverse outcomes in asthmatics due to air pollution

- Hospitalization rate
- Admission to Accident and Emergency departments
- Mortality rate
- Poor lung function
- Increase use of medication

Wong and Lai. Curr Opin Pulm Med. 2004;10(1):62-6.
Riedl A. Curr Allergy Asthma Rep. 2008 ;8(2):139-46.

Studies in Hong Kong

- Wong et al. Air pollution and hospital admissions for respiratory and cardiovascular diseases in Hong Kong. Occup Environ Med. 1999;56(10):679-83.
- Wong et al. Temporal relationship between air pollution and hospital admissions for asthmatic children in Hong Kong. Clin Exp Allergy 2001;31:565-9.
- Ko et al. Temporal relationship between air pollutants and hospital admissions for chronic obstructive pulmonary disease in Hong Kong. Thorax 2007;62:780-5.

Results : Childhood study 2001

Table 1. Seasonal variations in admissions and levels of air pollutants

Season	Admissions	PM_{10} mean ± S.D. ($\mu g/m^3$)	NO_2 mean ± S.D. ($\mu g/m^3$)	SO_2 mean ± S.D. ($\mu g/m^3$)
Autumn (September–November)	395	51.2 ± 29.8	51.7 ± 17.6	10.6 ± 9.6
Winter (December–February)	304	57.0 ± 29.7	46.6 ± 15.5	10.0 ± 7.5
Spring (March–May)	294	41.7 ± 21.4	40.7 ± 11.8	9.6 ± 8.8
Summer (June–August)	224	29.5 ± 18.1	32.6 ± 13.7	18.5 ± 19.5

Wong et al. Clin Exp Allergy 2001;31:565-9.

USNAAQS : Air Quality Standards

http://www.epa.gov/ttn/naaqs/

Pollutant	Averaging time	NAAQS concentration
Particulate matter ≤ 10 μm (PM_{10})	24 hours	150 $\mu g/m^3$
	1 year	50 $\mu g/m^3$
Particulate matter ≤ 2.5 μm (PM_{10})	24 hours	65 $\mu g/m^3$
	1 year	15 $\mu g/m^3$
Sulfur Oxides	3 hours	0.50 ppm (1300 $\mu g/m^3$)
	24 hours	0.14 ppm (365 $\mu g/m^3$)
	1 year	0.03 ppm (80 $\mu g/m^3$)
Nitrogen dioxide	1 year	0.053 ppm (100 $\mu g/m^3$)
Carbon monoxide	1 hour	35 ppm (40 mg/m^3)
	8 hours	9 ppm (10 mg/m^3)
Ozone	24 hours	0.12 ppm (235 $\mu g/m^3$)
	1 year	0.08 ppm (157 $\mu g/m^3$)

Association of asthma admission and pollution levels

Relative risk of asthma admission for a 10 mcg/m3 increase in air pollutants

Season	Pollutants	Lag time	Relative risk	P
Whole year	NO2	0	1.08	0.001
	SO2	3	1.06	0.004
	PM10	5	1.03	0.017
Summer	PM10	5	1.06	0.025
Autumn	NO2	0	1.08	0.0017
	PM10	5	1.07	0.003

Wong et al. Clin Exp Allergy 2001;31:565-9.

Effects of air pollution and lung function

Gauderman et al. NEJM 2004;351:1057-67.

Subjects: Prospective cohort of 1759 children aged 10 years, California, USA. Subjects were followed for 8 years

Methods: Lung function assessment yearly

Analysis: Relationship between average pollution levels and lung function

Effects of Airborne Particulate Matter on Respiratory Morbidity in Asthmatic Children

Ma et al. J Epidemiology 2008;18:97-110.

- Subjects : A panel of 19 children aged 8-15 with asthma with long-term hospitalization at Shimoshizu National Hospital in Chiba Prefecture
- Assessment of Peak Expiratory Flow rate (PEF) on a twice daily basis, Nov 03 to Mar 04
- Evaluate the change in PEF and change of $PM_{2.5}$

Traffic-related Air Pollution and Respiratory Symptoms in Children Living along Trunk Roads in Chiba Prefecture, Japan

Shima M et al. J of Epidemiology 2003;13:108-19.

- 2506 Subjects aged 6-9 followed for 4 years to assess the development of asthma
- Assessment of their home from a major road

Traffic, Susceptibility, and Childhood Asthma

McConnell R et al. Environmental Health Perspectives 2006;114:766-72

Subjects: 4762 children aged 7 yrs from California

Assessment of risk of physician diagnosis of asthma in relation to the distance of their home to a major road (freeway, highway, or arterial road)

Conclusions

- Air pollution does not explain world wide variation in asthma.
- Environmental pollutants of modern society cause deterioration of health in asthmatics.
- Accumulating evidence that traffic related pollution may induce the development of asthma.
- Linear relationship of pollution and detrimental effects.