The current issues and future prospect of the study on Asian Dust Events in Korea

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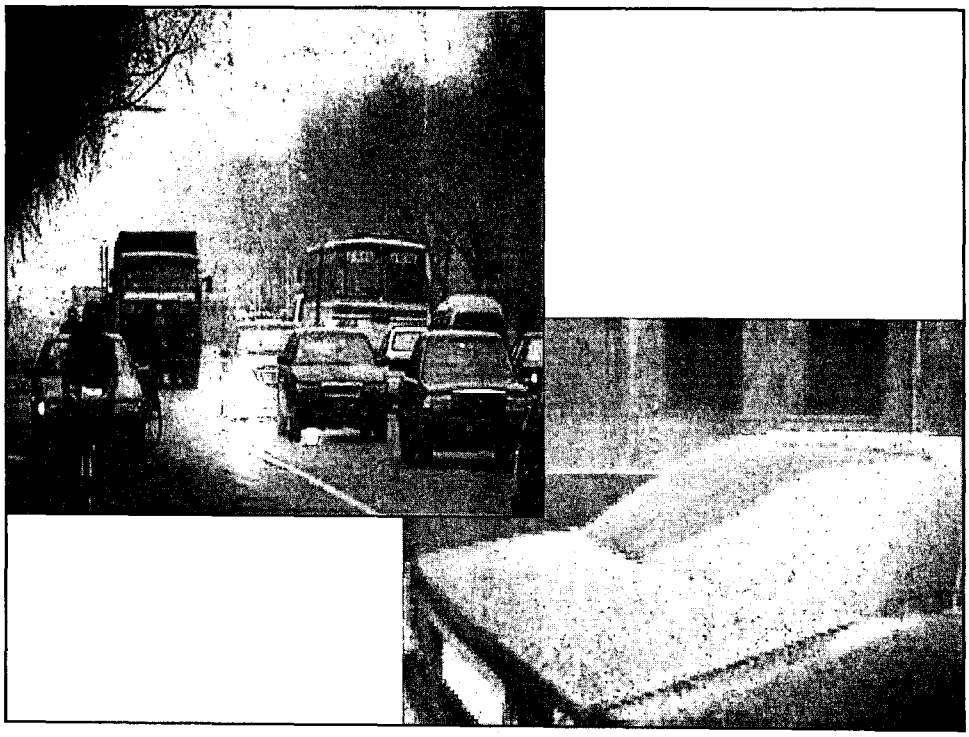
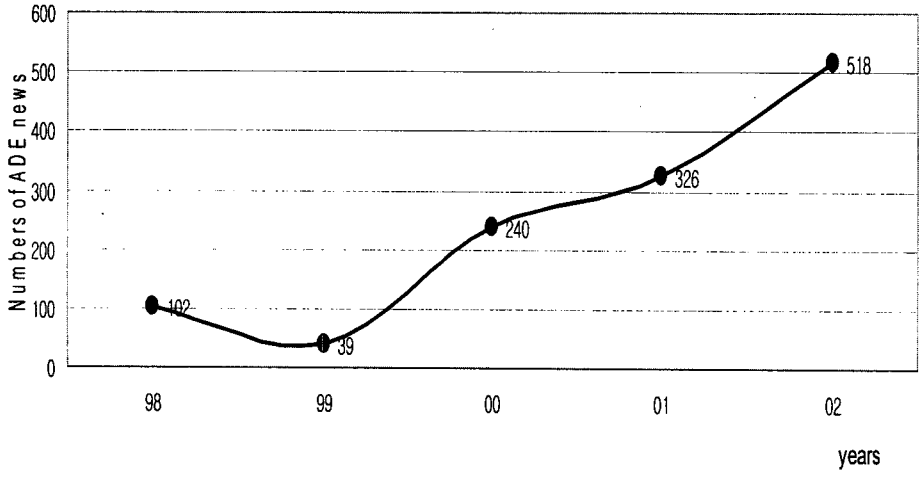


The Asian Dust Event (ADE)

- wind Blown Dust
- dust storm from Mongolia and China
- yellow cloud in Korea ("黃砂")
- across the Pacific to the West Coast of USA
- air particulate associated with lung cancer & COPD
- particulates contain high PAHs (Park, *et al.*, 2001)
- In the previous studies, which were measured only air pollutants levels during ADE

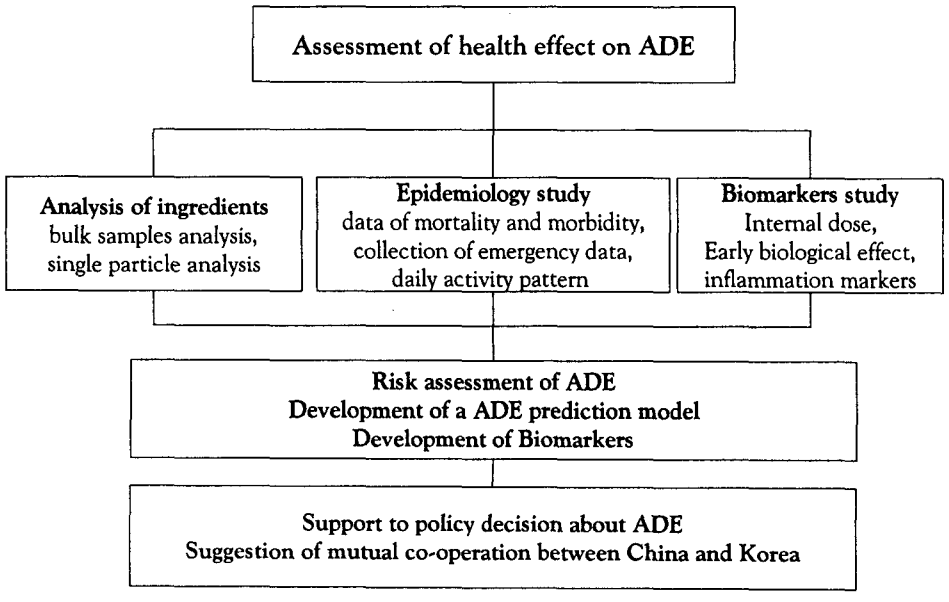
Be concerned about ADE



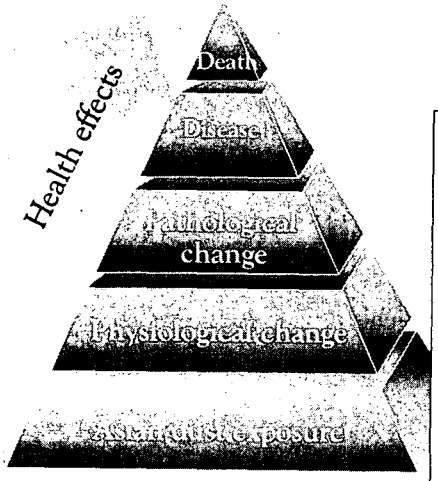
Objectives

- The objective of this study is to assess what type of effect Asian Dust has in causing disease. Detailed objectives are as follows.
  - To come up with raw data needed to evaluate Asian Dust's hazard quantitatively by analyzing Asian Dust's constituent (or components or elements)
  - To find out the link between Asian Dust and related death & diseases after comparing its results with China
  - To contribute to the analysis of epidemiologic study result by coming up with biomarkers which reflects the exposure to Asian Dust

Scheme of research project



Epidemiology Study on ADE



1st year

- Using the hospital data (Cardiovascular disease and respiratory disease)
- Relation between ADE and death
- Daily activity pattern of children on 2002 ADE

2nd year

- The panel study for a breath test and diseases
- chronic obstructive pulmonary disease
- Behavior change of before-and after ADE
- Establishment of surveillance system about acute health effect by ADE

1. Epidemiologic Study

- *The effects of Asian Dust events on perceived symptoms and behavior of elementary school students*

Objective

- **This study was designed to examine the perceived symptoms and behavior change of children during the Asian Dust events.**

Method

- Subjects
  - Children: 459 elementary school students
  - Adults: students' parents
  - Old man: live in Seoul in Korea
- Questionnaires
  - Nov. 20th, 2002 – Nov. 27th, 2002
  - socio-demographic factor, previous respiratory disease, and perceived symptom, hospital visits and behavior change during the Asian dusts.

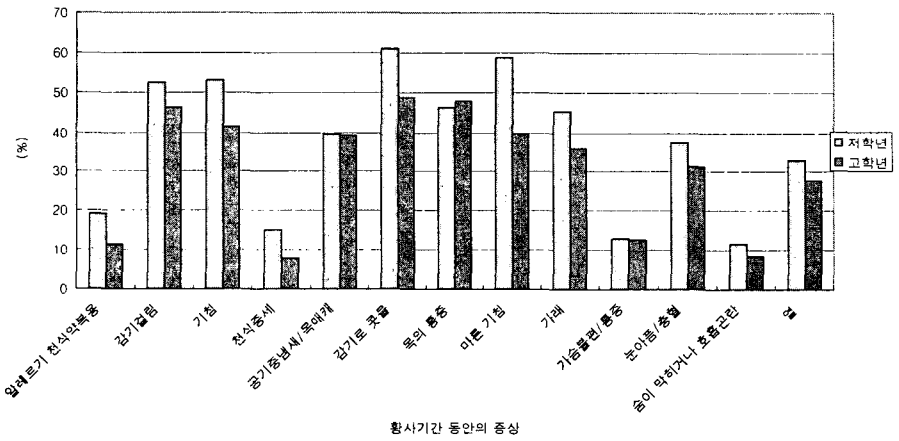
Odds ratios and 95% confidence intervals of the perceived symptom during the Asian dust events among children, adult and elderly

Dependent	Independent (Baseline: Adult)	
	Children	Adult
Medication for allergy or asthma	1.90 (1.15-3.13)	2.84 (0.52-15.46)
Cold	1.51 (1.13-2.01)	1.60 (0.53-4.79)
Cough	1.68 (1.25-2.26)	1.65 (0.54-5.08)
Asthma symptom	1.73 (0.98-3.05)	1.44 (0.25-8.25)
Bad smell in the air	0.56 (0.42-0.75)	1.06 (0.36-3.14)
Rhinorrhea due to cold	1.46 (1.10-1.94)	1.00 (0.33-3.05)
Sore throat	1.04 (0.78-1.38)	0.78 (0.25-2.42)
Dry cough	1.02 (0.76-1.35)	0.52 (0.16-1.77)
Phlegm	0.80 (0.593-1.07)	0.35 (0.09-1.38)
Chest pain	0.70 (0.46-1.08	0.95 (0.19- 4.70)
Eye congestion	0.66 (0.49- 0.89)	1.87 (0.64-5.47)
Dyspnea	0.78 (0.48-1.25)	2.21 (0.54-9.12)
Fever	2.39 (1.67-3.43)	1.98 (0.51-7.75)

*Adjusted for past history of respiratory disease, exposure to environmental tobacco smoke, distance from home to road, and economic status

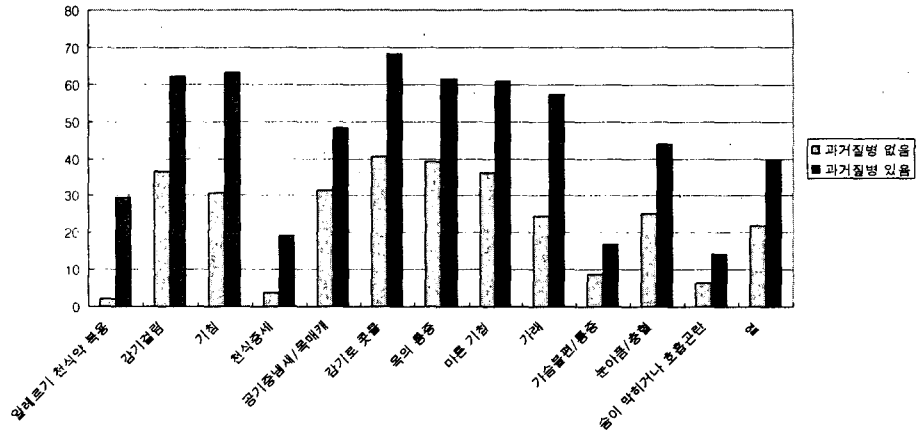
Study on symptoms and behavior change during the Asian dust events among children

- Symptoms associated with elementary school grade (Higher vs Lower).



Study on symptoms and behavior change during the Asian dust events among children (cont'd)

- Symptoms associated with past medical history (Yes vs No).



*Odds ratios and 95% intervals of behaviors during the period of Asian dust events among children, adult and elderly**

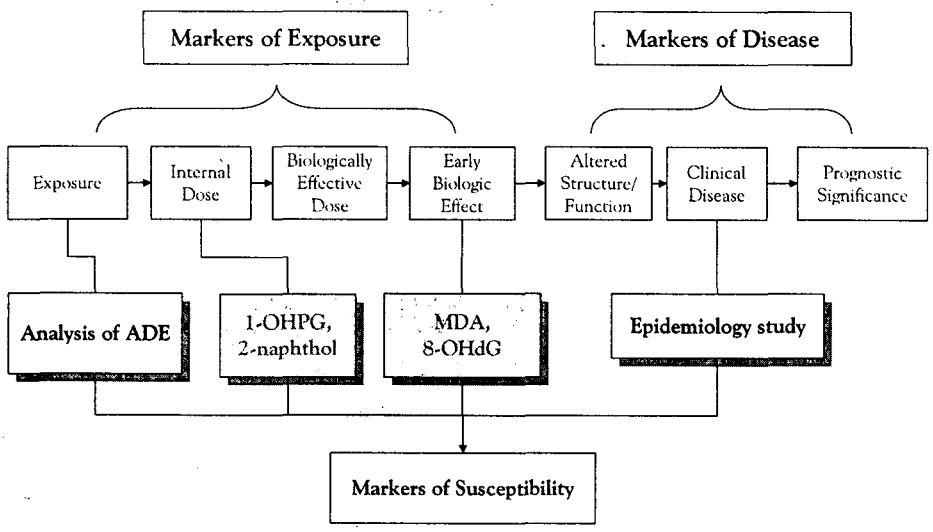
	Independent (Baseline:Elderly)	
Dependent	Children	Adult
Closing window	2.61(0.99-6.92)	2.93(1.10-7.78)
Wearing mask	1.31(0.74-2.32)	0.78(0.44-1.39)
Taking less outdoor recreational activity	4.10(2.15-7.48)	3.63(1.20-6.85)
Stay home rather than going out as usual	2.92(1.46-5.82)	2.48(1.26-4.88)
Using humidifier	1.34(0.63-2.86)	1.25(0.59-2.67)
Eating after washing vegetables or fruit	2.43(1.09-5.45)	2.88(1.28-6.49)
Cleaning up more frequent	1.47(0.81-2.66)	2.32(1.26-4.24)
Drinking more water than regular base	1.05(0.59-1.85)	1.03(0.59-1.82)
Do not eat food on the street	2.65(1.49-4.71)	3.86(2.16-6.92)

* Adjusted for past history of respiratory disease

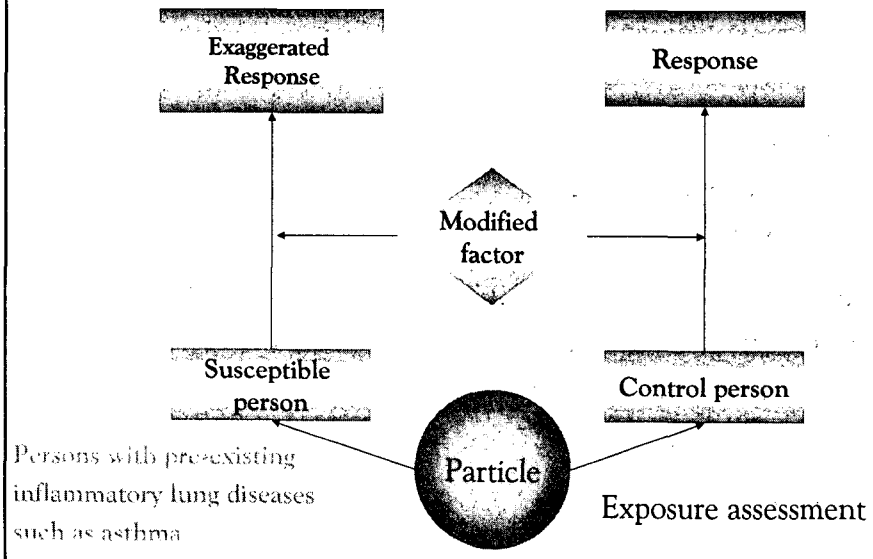
Conclusions

- This study suggested that the younger children and children who had past respiratory disease were susceptible to the effect of Asian dusts.
- There is a need for providing public information and health education to prevent the impact of Asian dusts on health.

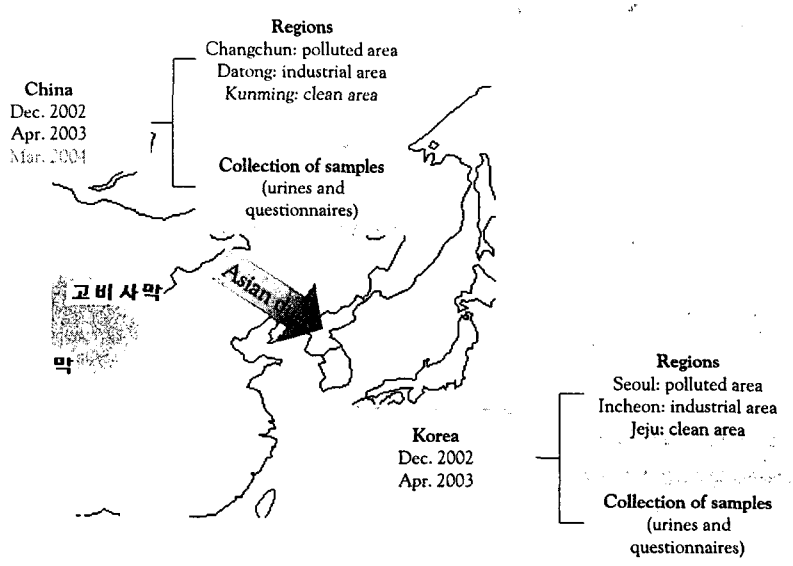
2. Biomarker study



Response assessment using biomarkers



Samples collection

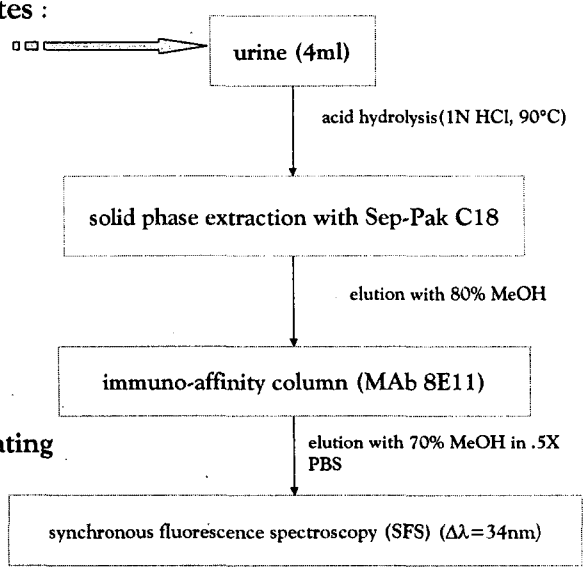


Objectives

- assessment of biomarkers related to PAH exposure
  - Urinary 1-hydroxypyrene glucuronide (1-OHPG)
- to estimate the association between urinary PAH metabolites and oxidative damage marker (MDA) in Chinese and Korean.
- the factors related with urinary PAH metabolites were evaluated.

Methods

- urinary PAH metabolites :
  - 1-OHPG by IAC/SFS
  - 2-naphthol by HPLC (Ex 227, Em 355)
- MDA
  HPLC-UV (532nm)
- Questionnaire
  - diets
  - ETS
  - type of cooking and heating fuels
  - other life-style characteristics

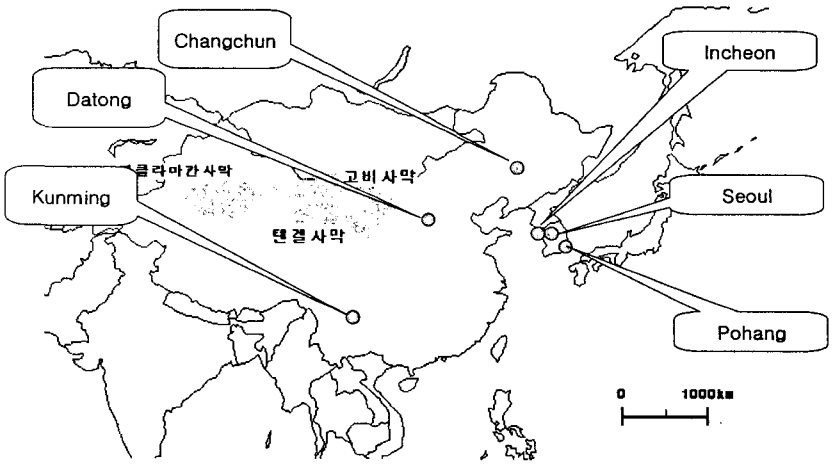


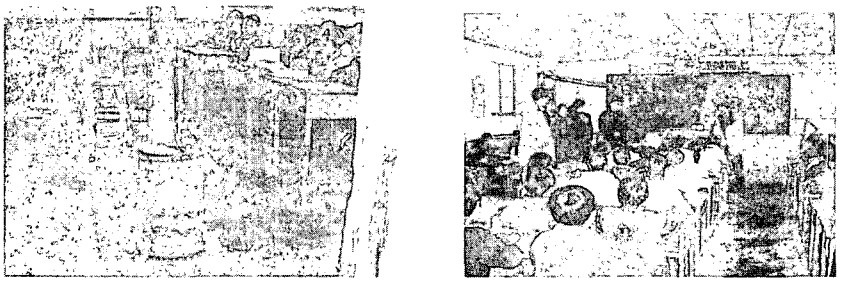
Subjects

- elementary school children and their mothers
- age: 9-15 years old
- Korean: 196 students and their parents
- Chinese: 165 students and their parents
- Duration: July, 2002 and December, 2002

Country	regions	subjects		
		students	mothers	Total
Korea	Seoul	156	156	312
	Inchon	20	20	40
	Pohang	20	20	40
China	Changchun	125	125	250
	Datong	20	20	40
	Kuming	20	20	40
	Total	361	361	722

Regions

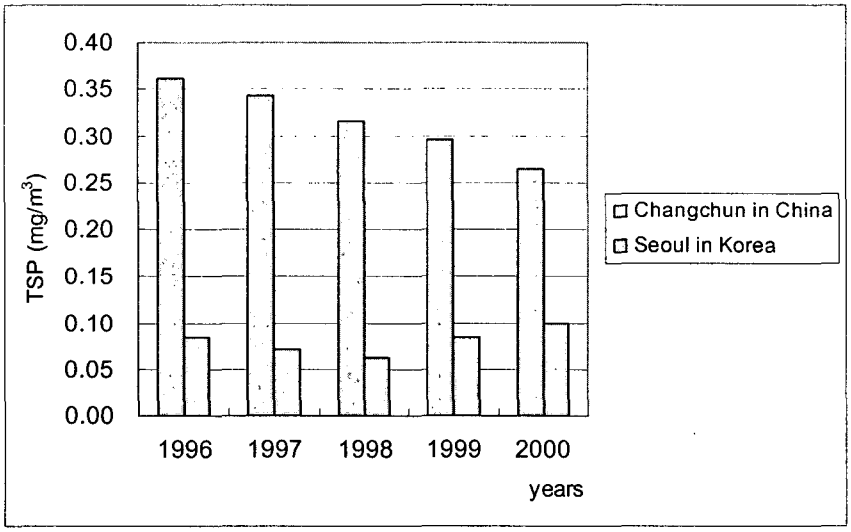




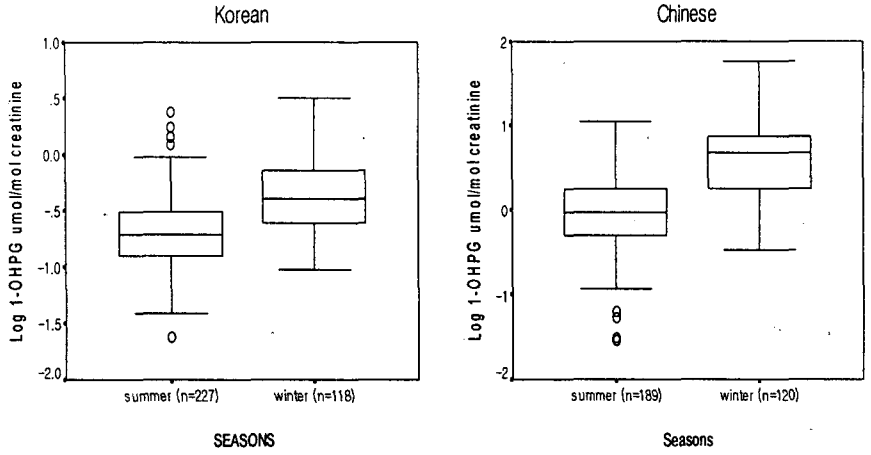
Classroom of Chinese elementary school

Classroom of Korean elementary school

TSP between Chinese and Korean



1-OHPG levels on summer (July) and winter (December)



Unit: μmol/mol creatinine
Seasons: summer (Jul, 2002) and winter (Dec, 2002) ($p<0.01$, by Student t-test).

Urinary 1-OHPG levels (μmol/mol creatinine)

Categories	Korean		Chinese		p-value*
	n	mean ± SD	n	mean ± SD	
total	346	0.39 ± 0.45	308	3.48 ± 5.52	< 0.01
Students	175	0.35 ± 0.39	155	4.19 ± 6.93	< 0.01
parents	171	0.42 ± 0.50	153	2.76 ± 4.10	< 0.01

* Student t-test

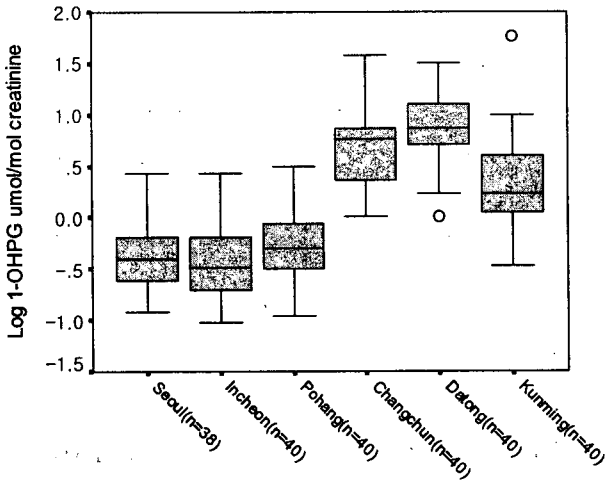
Urinary 2-naphthol levels (μg/g creatinine)

Categories	Korean		Chinese		p-value*
	n	mean ± SD	n	mean ± SD	
total	203	22.67 ± 38.54	308	73.34 ± 134.55	< 0.01
Students	96	18.56 ± 27.40	100	94.54 ± 195.03	< 0.01
parents	107	26.78 ± 49.68	100	52.13 ± 74.06	< 0.01

* Student t-test

Levels of log 1-OHPG in all subjects

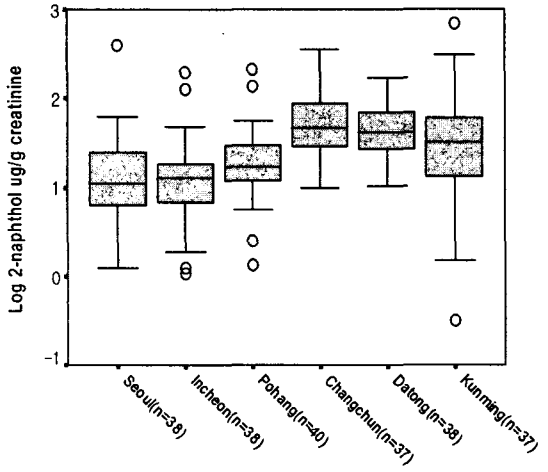
(n=238)



P<0.001, By ANOVA

S (Seoul), I (Inchon), P (Pohang), C (Changchun), D (Datong), K (Kunming)

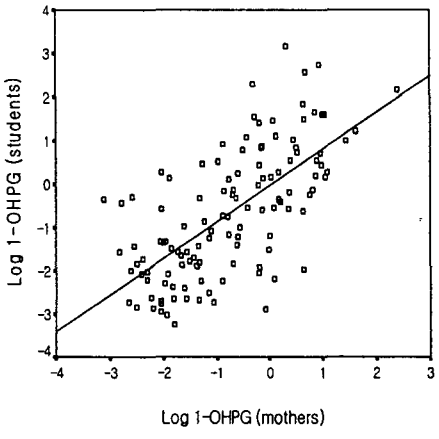
Levels of log 2-naphthol in all subjects (n=228)



P=0.001, By ANOVA

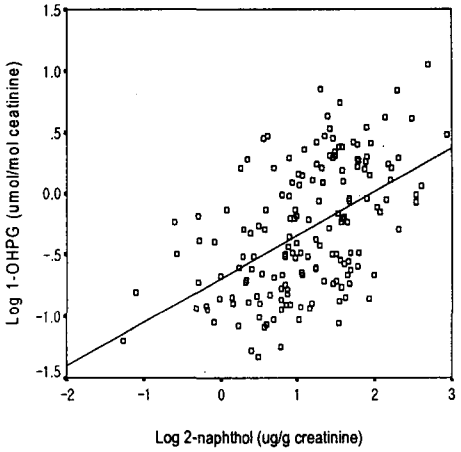
S (Seoul), I (Inchon), P (Pohang), C (Changchun), D (Datong), K (Kunming)

Correlation between students and mothers



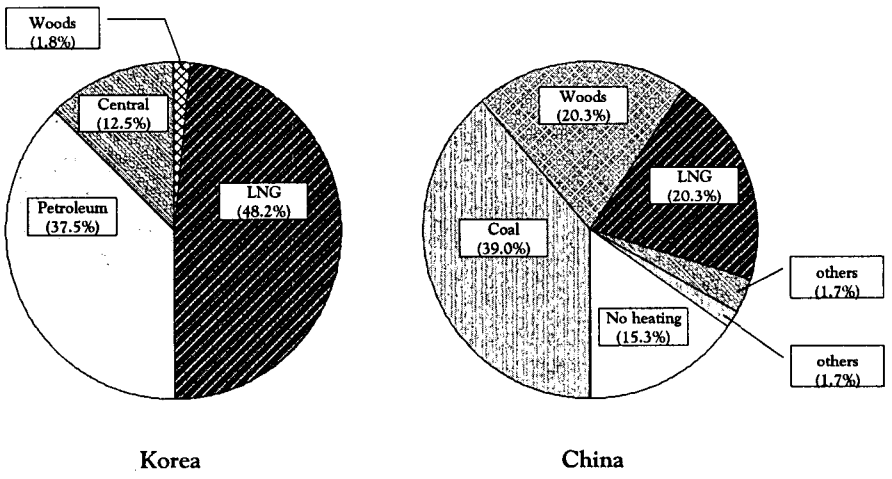
- Pearson's correlation coefficient $r=0.671$, $p<0.01$

Correlation between 1-OHPG and 2-naphthol

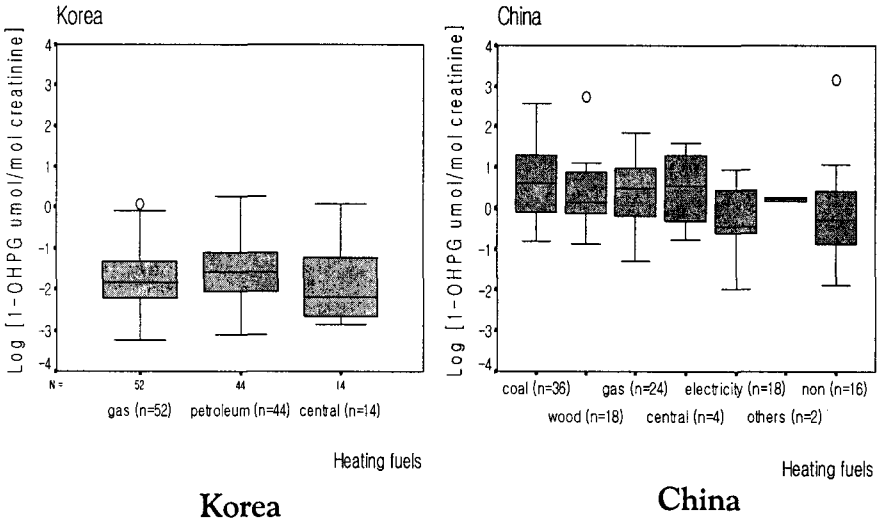


- Pearson's correlation coefficient $r=0.51$, $p<0.01$, n=176

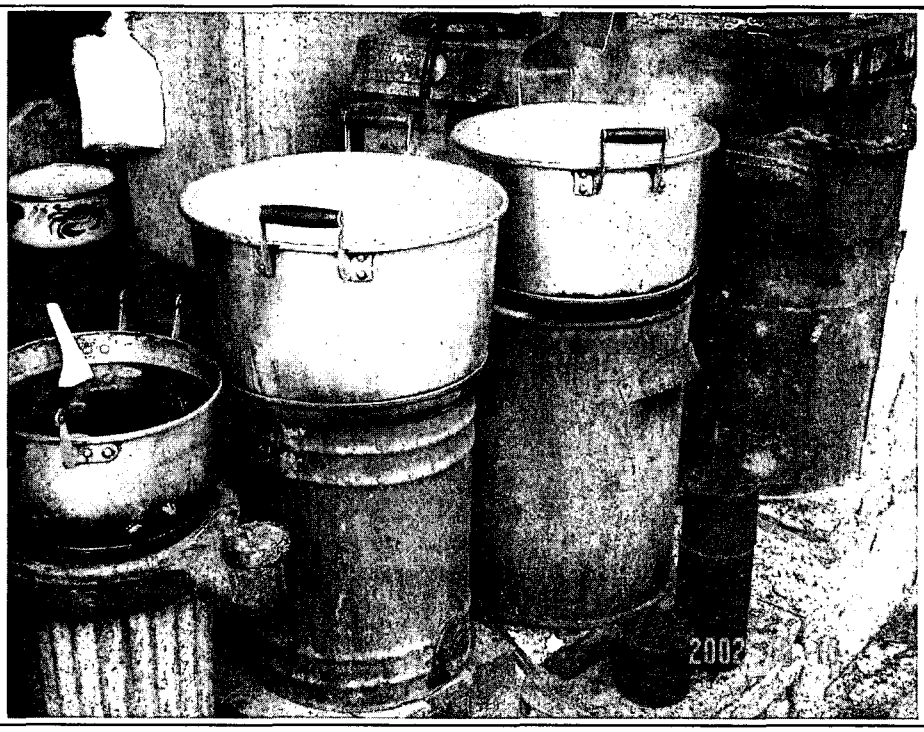
Type of heating fuels

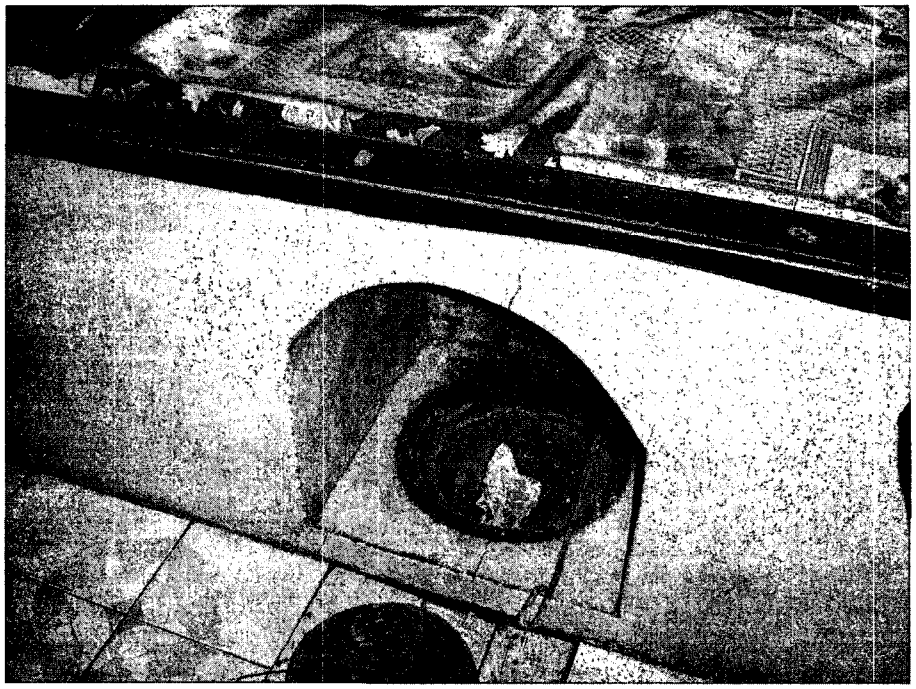


Type of heating fuels vs. 1-OHPG



Korea **China**





Multiple linear regression analysis of urinary 1-OHPG levels ***(overall model r^2=0.32, n=244)***

Variables	ß	S.E.	P-value
Age	-0.12	0.01	0.05
Type of heating fuels[1]	-0.15	0.02	**0.02**
ETS[2] (yes vs. no)	-0.06	0.07	0.37
Roasted meat (yes vs. no)	-0.04	0.03	0.57
Drinking water[3]	-0.22	0.06	**<0.01**

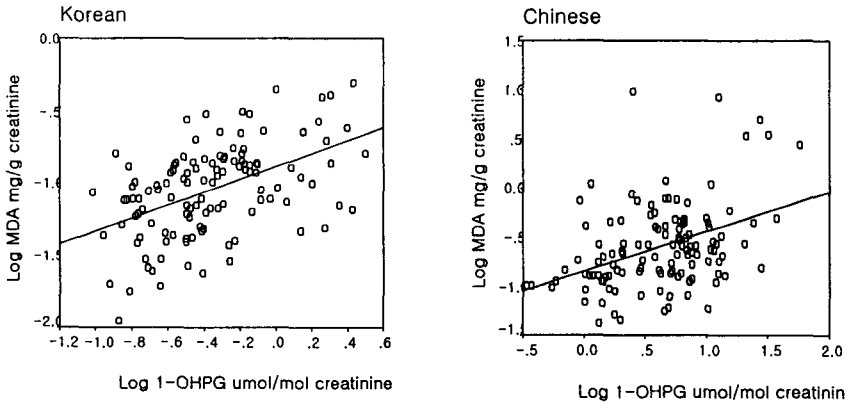
[1][coal, woods, gas, petroleum and central heating] vs. [electricity, non-heating and others]
[2]environmental tobacco smoke
[3]well water vs. tap water

Urinary MDA levels (mg/g creatinine)

Categories	Korean		Chinese		*P*-value*
	n	mean ± SD	n	mean ± SD	
students	60	0.11 ± 0.08	60	0.56 ± 1.25	< 0.01
parents	58	0.13 ± 0.10	60	0.53 ± 1.35	< 0.01
Total	118	0.12 ± 0.09	120	0.55 ± 1.29	< 0.01

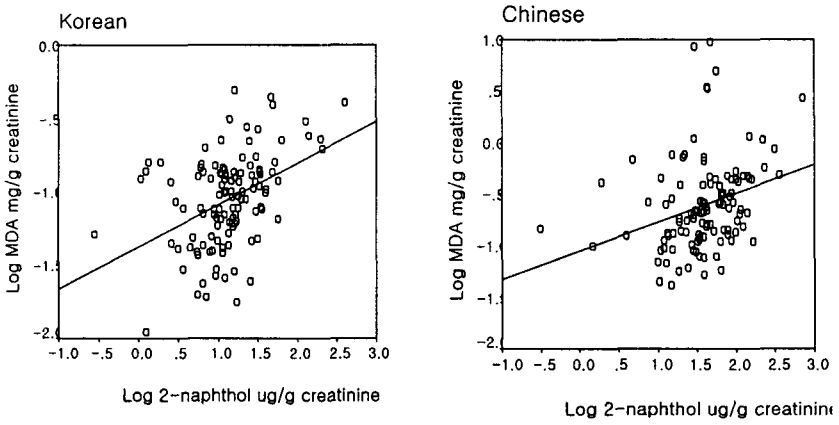
* Student t-test

Correlation between 1-OHPG and MDA



Korean: Pearson's correlation coefficient r=0.49, P<0.01, n=118,
Chinese: r=0.40, P<0.01, n=120

Correlation between 2-naphthol and MDA



Korean: Pearson's correlation coefficient $r=0.42$, $P<0.01$, n=116,
Chinese: $r=0.30$, $P<0.01$, n=112.

Summary

- There was a significant correlation between urinary log 1-OHPG and log 8-OHdG levels before the ADE.
- There was also a significant correlation between urinary MDA and 8-OHdG levels after the ADE.
- Significantly higher levels of urinary PAH metabolites were observed among Chinese children than Korean children
- There was a significant correlation of urinary PAH metabolites between children and their mothers living in the same household.