

Toxicogenomics and Environmental Epidemiology

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Objectives of Environmental Epidemiology

- To identify the etiology or the cause of a environmental disease
- To determine the extent of environmental disease found in the community.
- To study the natural history and prognosis of environmental disease.
- To provide the foundation for developing public policy and regulatory decisions relating to environmental problems.

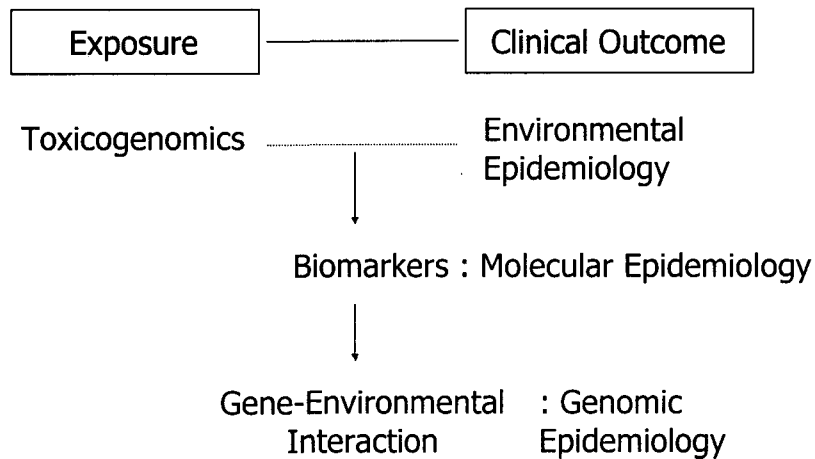
Molecular Epidemiology

- ◆ **Molecular epidemiology bridges basic research in molecular biology and studies of human disease causation by combining laboratory measurement of internal dose, biologically effective dose, biologic effects, and the influence of individual susceptibility with epidemiologic methodologies.**

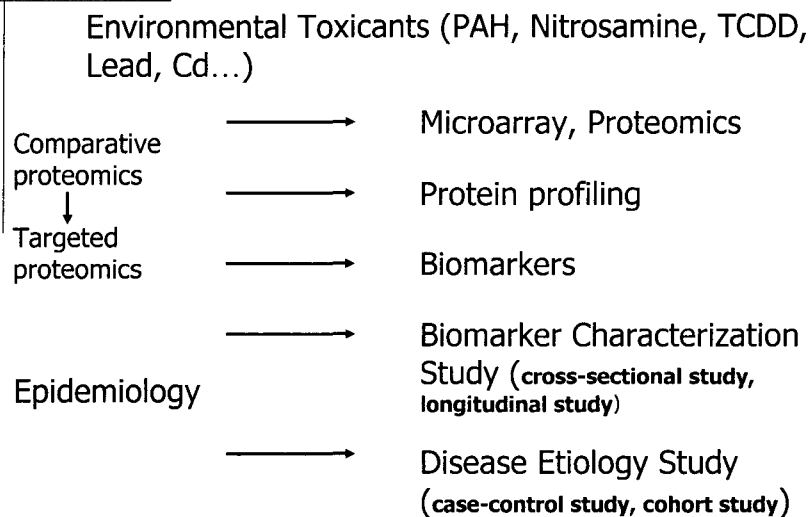
Toxicogenomics

- ◆ **Toxicogenomics elucidates how the entire genome is involved in biological responses of organisms exposed to environmental toxicants/stressors.**
- ◆ **Toxicogenomics combines information from studies of genomic-scale mRNA profiling (by microarray analysis), cell-wide or tissue-wide protein profiling (proteomics), genetic susceptibility, and computational models to understand the roles of gene-environmental interactions in disease.**

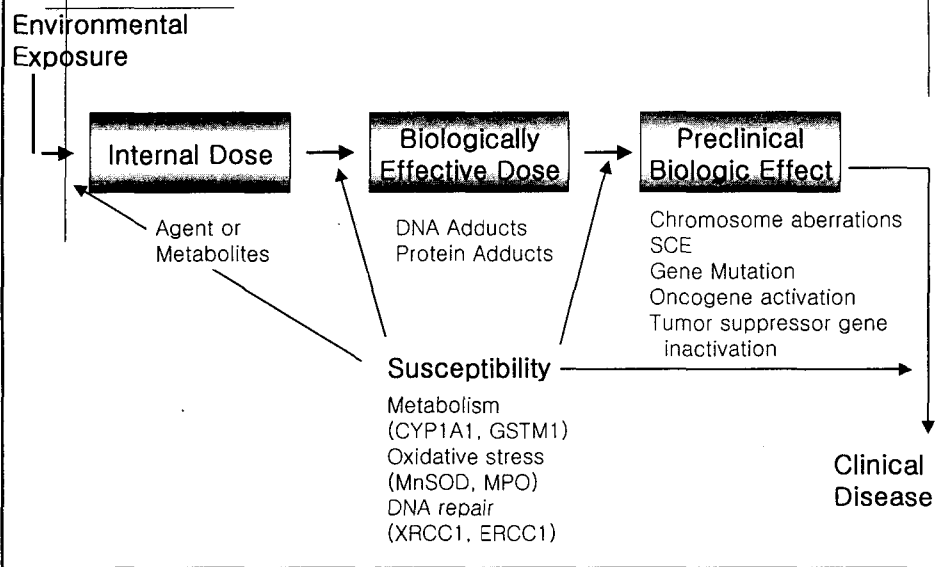
Toxicogenomics and Environmental Epidemiology



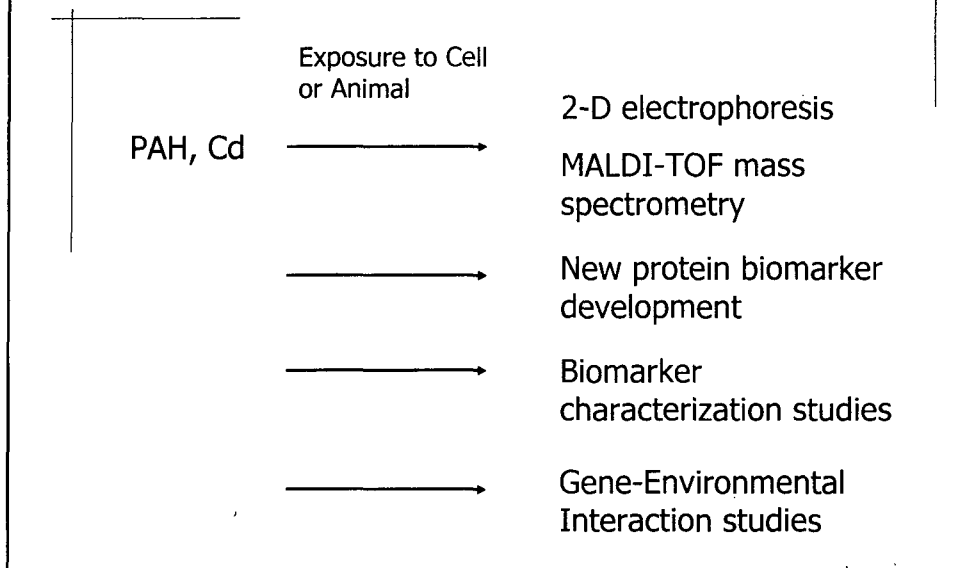
Biomarker Study



Gene-Environmental Interaction Study



A Research Concept (Eco)

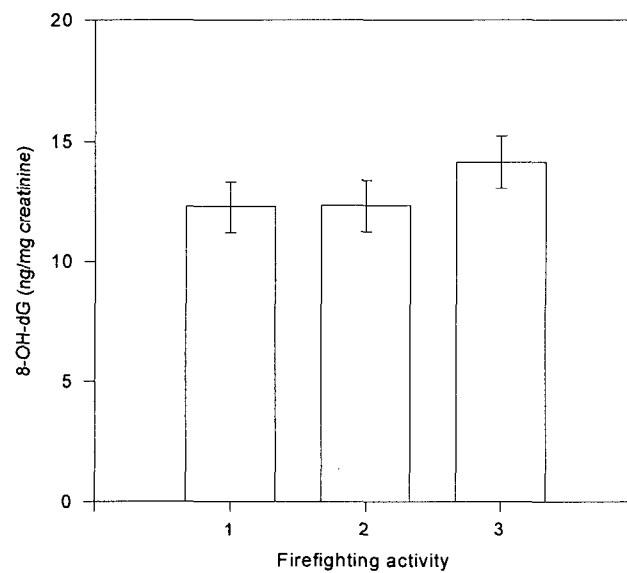


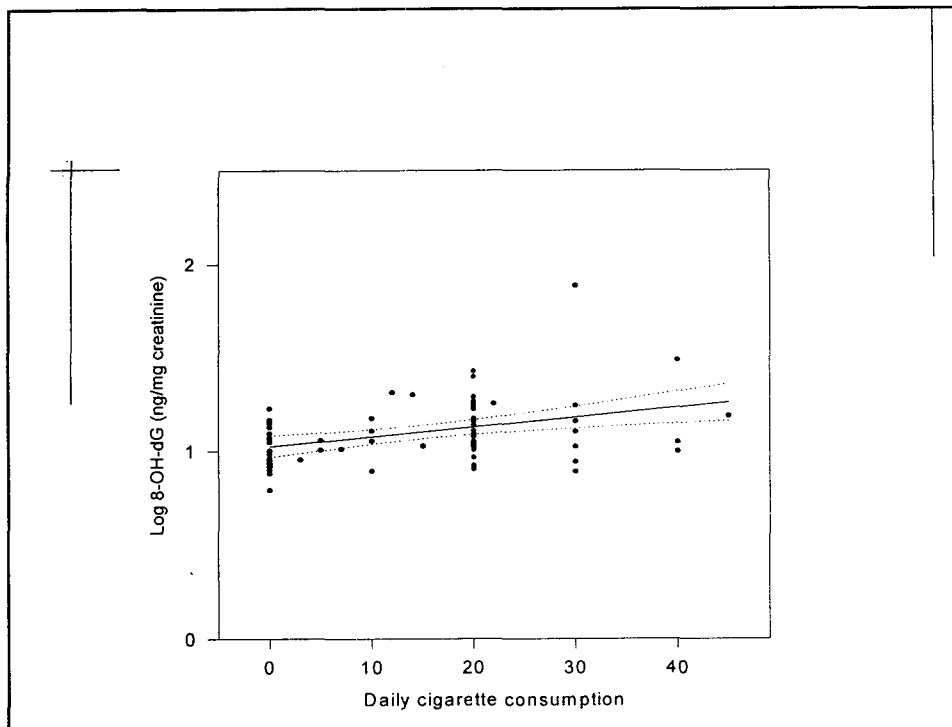
Biomarker Study

Influence of genetic susceptibility on the urinary excretion of 8-hydroxydeoxyguanosine of firefighters

Yun-Chul Hong, Hye-Sook Park, Eun-Hee Ha

Occup Environ Med 2000; 57: 370-375





Gene-Environmental Interaction Study (1)

Variations in urinary 1-hydroxypyrene glucuronide
in relation to smoking and modification effects of
GSTM1 and GSTT1

Yun-Chul Hong, Jong-Han Leem, Hye-Sook Park, etc.

Toxicology Letters 1999; 108: 217-223

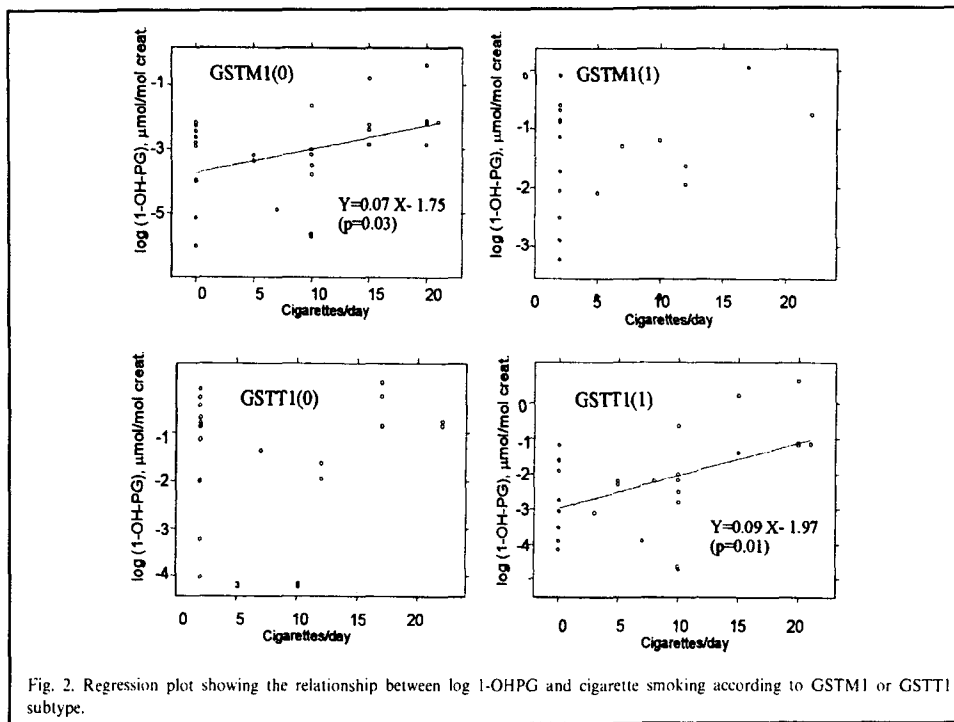


Fig. 2. Regression plot showing the relationship between log 1-OH-PG and cigarette smoking according to GSTM1 or GSTT1 subtype.

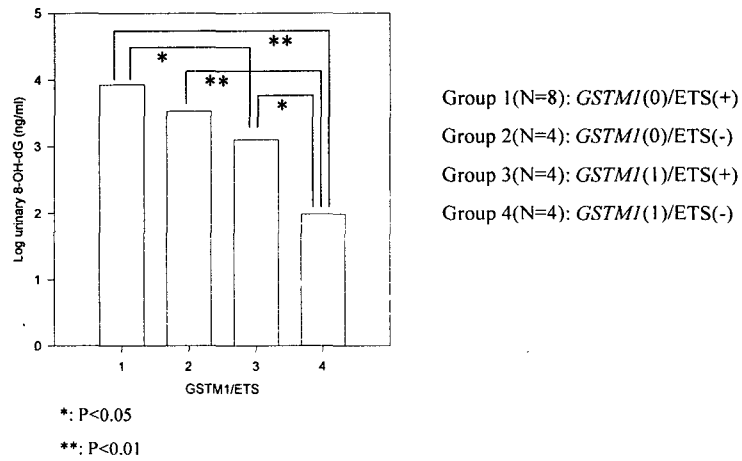
Gene-Environmental Interaction Study (2)

Maternal Genetic Effects on Neonatal susceptibility
to Oxidative Damage From Environmental Tobacco
Smoke

Yun-Chul Hong, Heon Kim, Moon-Whan Im, etc.

J Natl Cancer Inst 2001; 93: 645-647

Figure 1. Comparison of log concentrations of neonatal urinary 8-OHdG among *GSTM1*/*ETS* subgroups

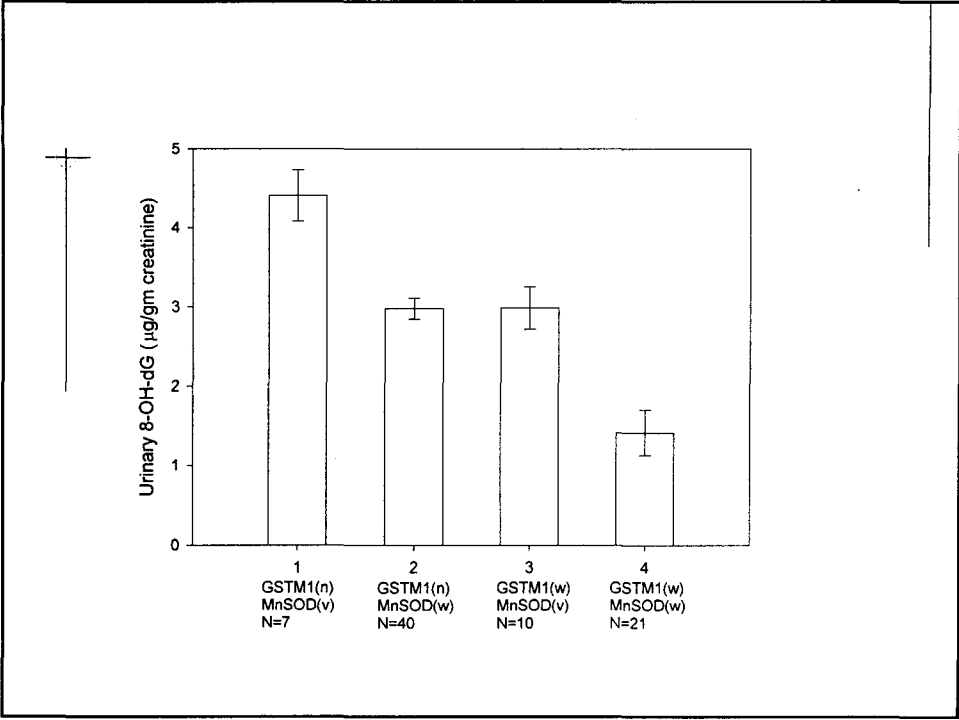


Genetic Susceptibility Study

Genetic Susceptibility of term pregnant women to oxidative damage

Yun-Chul Hong, Kwan-Hee Lee, Cheol-Ho Yi, etc

Toxicol Lett 2002; 129: 255-262



Biomarker Study Plan – Eco Study

Environmental Epidemiology of Bronchial Asthma,
Cerebrovascular Disease, Lung Cancer

Jung-Duk Park, Yun-Chul Hong, Heon Kim,
Sung-II Cho, Chung-Yeol Lee

Ecotechnopia

Biomarker distribution across cases and controls

Exposure Biomarkers

- PAH Exposure biomarker (1-OHP, 2-Naphthol)
- VOC exposure biomarker (Hippuric acid, Muconic acid)
- Heavy metal exposure biomarker (Cadmium)
- Smoking (Cotinine)

Early Biological Effect Biomarker

- Oxidative injury biomarker (8-OH-dG, MDA)

Genetic Susceptibility Biomarkers

- CYP1A1, CYP2E1, GSTM1, GSTT1, GSTP1, NAT2, UGT1A6
- MPO, MnSOD, GPX

To Know About...

Association between Air Pollution and Disease

- air pollution and exposure biomarker
- relationship between exposure and early biological effective biomarker
- early biological effective biomarker and disease

Genetic susceptibility

- gene-environmental interaction
- gene-gene interaction

Thank you very much!

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