Health Studies Update

AQMD Governing Board Retreat
April 12 - 13, 2012

Cleaning the Air That We Breathe…

Summaries of Two Studies

• Occupational exposure to diesel exhaust increases mortality risk
  – Lung cancer
  – Esophageal cancer
  – Pneumonoconiosis

• Long-term PM$_{2.5}$ exposure increases mortality risk
  – With lower exposure trend and changing composition over 35-year time period
Diesel Exhaust Occupational Health Study

Weight of the Evidence or Wait for the Evidence?
Protecting Underground Miners From Diesel Particulate Matter

A coalition of three organizations has used a variety of tactics, including scientific integrity and access to public health data, to oppose a federal effort to control diesel particulate matter. Their resistance, the coalition said, was aimed at the highest level of exposure, where miners are exposed to diesel exhaust, along with various other toxic substances, for the majority of the day at a time when diesel exhaust is a well-known carcinogen. The group said that the government’s efforts to control diesel exhaust were being undermined by the mining industry, which is using its lobbying power to delay implementation of new standards.

The Diesel Exhaust in Miners Study (DEMS)

- National Cancer Institute
- National Institute for Occupational Safety & Health

- The Diesel Exhaust in Miners Study: V. Evaluation of the Exposure Assessment Methods.

- The Diesel Exhaust in Miners Study: A Cohort Mortality Study With Emphasis on Lung Cancer.
  Attfield, M.D. et al., J Natl Cancer Inst doi:10.1093/jnci/djs035, published online: March 5, 2012

- The Diesel Exhaust in Miners Study: A Nested Case-Control Study of Lung Cancer and Diesel Exhaust.
**DEMS Study Overview**

- 8 non-metal mining facilities
  - High levels of diesel exhaust underground
  - Low levels of potential confounders (i.e., asbestos, silica, radon)
  - Case – control study design
- All blue-collar workers ≥1 year on job
- Follow-up from time of diesel equipment introduction (1947-1967 depending on facility) through 1997
- Respirable Elemental Carbon (REC) as estimate of diesel exhaust exposure

**DEMS Study Findings**

- Diesel exhaust exposure associated with lung cancer mortality
  - Adjusted for smoking and other factors
  - Steep increase in risk at low to moderate exposures
  - Plateau or decline in risk at heavier exposures
- Ambient levels of EC in highly polluted cities (2-6 μg/m³) approximates cumulative exposures in low exposure miners
Odds Ratios for Lung Cancer by Categories of Average & Cumulative Respirable Elemental Carbon (REC) Intensity

- Solid squares represent lung cancer risk by expanded exposure categories
- Lines indicate different model specifications

Adapted from Silverman DT et al. J Natl Cancer Inst 2012

Harvard 6-Cities Study

- Participants recruited 1974-1977
- 25-74 years old at enrollment
- PM$_{2.5}$ measured at central site
- Vital status & cause of death to 2009
- PM$_{2.5}$ levels declined overall
- Annual PM$_{2.5}$ as low as 8 μg/m³

Lepeule J, Laden F, Dockery D, Schwartz J
Environ Health Perspect. Online: 28 March 2012
Harvard 6-Cities Study Findings

- With a 10 μg/m³ increase in PM$_{2.5}$
  - 14% increase in all-cause mortality
  - 26% increase in cardiovascular mortality
  - 37% increase in lung cancer mortality
- Relationship between long-term PM$_{2.5}$ and mortality found to be linear
- No evidence of threshold for effects
- Estimated effects did not change over time