

NEW RESEARCH ON HEALTH EFFECTS OF AIR POLLUTANTS (PART I):

PM AND GASEOUS POLLUTANTS

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PM and Gaseous Pollutants

- Introduction: Possible Pathways of Injury by Air Pollutants
- O₃: Short-Term Effects on Mortality
- O₃: Long-Term Exposure and Lung Function - A Study in Young Adults
The Southern California Children's Health Study
- Update on SO₂: Health Effects & Role Surrogate Index for Other Toxicants
- NO₂: A Surrogate of Traffic or Pollutant in its Own Right? A Brief Review of Evidence
- NO₂: Sources, Air Quality and Chemistry in the Atmosphere
- Concluding Remarks

Pollutants: Deposition/Uptake, Clearance and Disposition

Pathways:

- SO₂ - highly soluble, 98% uptake nanoparticles
- O₃ - relatively insoluble, reactive
eg., 40% uptake nanoparticles, reaches deeper lung
- NO₂ - less reactive, more soluble than O₃
- PM - Coarse, fine, ultrafine particles

Fractional Deposition of Inhaled Particles in the Human Respiratory Tract
(ICRP Model, 1994; Nose-breathing)

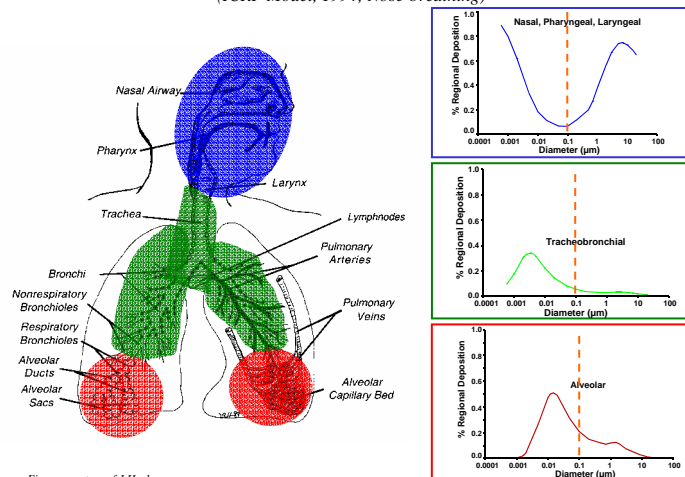


Figure courtesy of J.Harkema

NO₂ and SO₂: Status of Health Studies

NO₂:

1. Nitrogen dioxide exposure occurs both outdoors and indoors.
2. Asthmatics and children may represent particularly susceptible populations.
3. Inhalation of low-level NO₂ may influence incidence and severity of respiratory infections, particularly in children.

SO₂:

1. Asthmatics particularly susceptible populations.
2. Exercise or cold air greatly enhance SO₂ effects in asthmatics.

Health Effects of Ozone Exposure

- Respiratory symptoms:
 - Cough, chest tightness, dyspnea
- Decrements in lung function
- Reduced exercise capacity
- Exacerbation of asthma
- Airway inflammation
- Increased mortality

Pollutant Effects on the Lungs & Heart



Early (hrs)

- Epithelial Injury
- IL-8, IL-6, RANTES, etc.
- C-fiber stimulation
- Bronchoconstriction
- Airway Inflammation
 - PMN
 - Eosinophils
 - Lymphocytes

- Endothelial Dysfunction
- Monocyte Activation
- ↑ Circulating IL-6
- Platelet activation
- ↓ DLCO

- ↑ HR
- HRV
- Autonomic NS
- Ischemia?
- Arrhythmias?

Late (days)

- ↑ Airway permeability
- ↑ A-a pO₂

- ↑ Plasma viscosity
- ↑ Fibrinogen, CRP,
- ↑ Coagulation?

- ↓ HRV?
- Arrhythmias?

Later (Wks-mos)

- Repair & remodeling
- Progression of airways disease?

- Atherosclerosis?

- Progression of coronary artery disease?

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