

James Homolya, U.S. Environmental Protection Agency

“Going Beyond Regulatory-Based Sampling”

Going Beyond Regulatory-Based Sampling

**Overview, Objectives, Requirements,
and Approach**



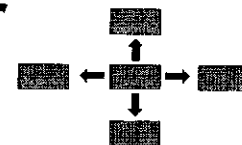
Sampling and Analysis Strategies

- 1. Determine specific monitoring objectives;**
- 2. Estimate concentration levels of expected target analytes;**
- 3. Match analytical detection limits to sample analyte amounts to be collected;**
- 4. Design sampling system/network based on 1,2 and 3 for reliability and cost-effectiveness; and**
- 5. Prepare a written sampling plan and update as appropriate.**

National PM2.5 Speciation Laboratory Program

Uses of Physical/Chemical Speciation Data

- **PM2.5 standard implementation**
 - Source attribution/air quality modeling analyses
 - Tracking progress of controls
- **Support health studies**
 - Link effects to PM2.5 constituents
- **Visibility**
 - Atmospheric characterization
 - Extinction calculations
- **Network design and site adjustments for
spatial averaging**

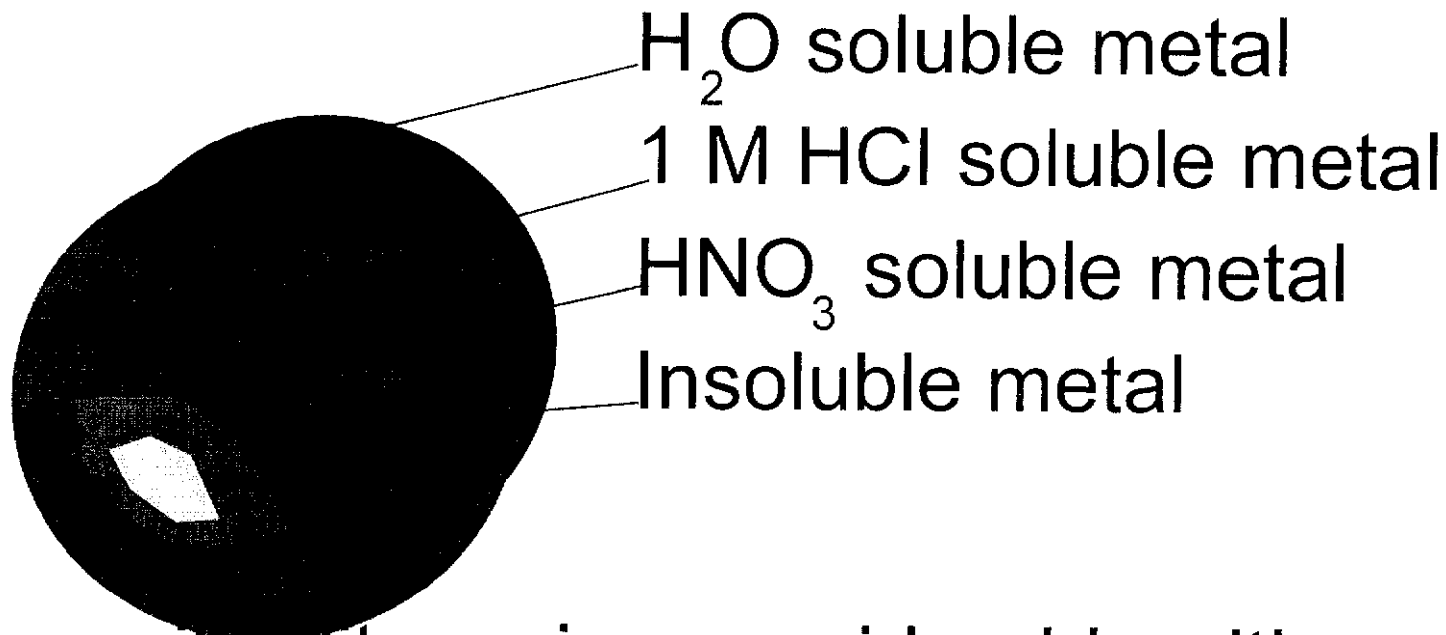


Particulate Matter Health Effects Research

- **Small particle chemistry and the effects of size and deposition within airways that cause injury to lung tissue**
- **Mechanisms which cause tissue damage and lung dysfunction**
- **Effects on at-risk groups of particulate exposure**
- **Interactions between pollutants and allergens on asthma development**
- **Variations in population sensitivity to air pollutants**
- **Source characterization/mitigation strategies for fine particulate**
- **Improved fine particulate monitoring capability**



Metallic Compounds as Constituents of Particles



Bioavailability varies considerably with particle size and emission source characteristics

Pulmonary Toxicology Research

- Water-soluble transition metal constituents of fine particulate matter deposited in airways may enhance lung injury.**

- Metal interactions and pH are found to influence the severity and kinetics of lung injury induced by soluble transition metals.**



Pulmonary Toxicology Research Contact

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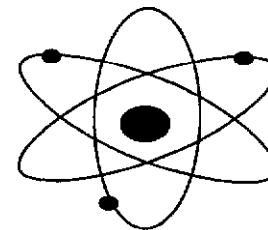
Speciation Monitoring Network

- **50 Core sites within NAMS**
 - **25 monitors collocated within PAMS**
 - **25 sites selected by EPA HQ/RAs/States**
- **Approximately 250 additional sites**
- **Estimated sample collection at every 6 days(NAMS) and every 12 days for others**
- **Analytes similar to those in IMPROVE**

National PM2.5 Speciation Laboratory Program

Target Analytes

- Cations: particulate ammonium; ionic sodium, calcium, magnesium
- Anions: particulate sulfate, nitrate, and chloride
- Carbon: organic and elemental
- Trace Elements: sodium, magnesium, etc., through lead
- Semivolatile organic particles



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Lab Analyses

Filter Medium	Analytes	Analysis Methods
Teflon	mass, elements, sulfate, chloride, ammonium ion, cation metals	gravimetry, XRF or PIXE, ion chromatography, colorimetry
Nylon	nitrates	ion chromatography
Quartz	elemental and organic carbon, semivolatile organics	controlled combustion, GC/MS

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Speciation Sample Handling

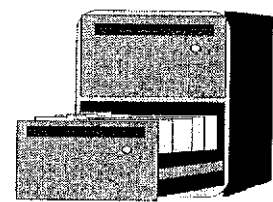
Potential requirement for multi-filter sample sets

Pre-/post-sampling filter operations,
transport and storage

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Required Guidance and Documentation

- SOPs for measurement of target analytes
- Laboratory QA guidelines specific to prescribed instrumental methods
- Standardized data reduction, validation and reporting formats(AIRS data entry)



National PM2.5 Speciation Laboratory Program

EPA's Approach

- **Provide laboratory specifications, SOPs, and QA requirements**
- **Develop national laboratory services support program**
- **EPA responsible for developing the contract scopes of work, overall program management, and QA audit support**

National PM2.5 Speciation Laboratory Program

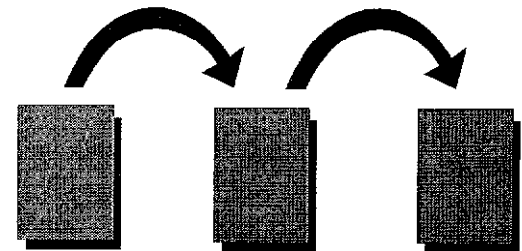
Timeline

Develop Program Team---10/97

Assemble Guidance and SOPs---3/98

Initial Deployment of Speciation Monitors---10/98

Begin Speciation Analytical Support Services---2/99



National PM2.5 Speciation Laboratory Program

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