ATSDR

AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

For more information,

contact ATSDR's toll-free information line:

(888) 42-ATSDR. . . that's (888) 422-8737

ATSDR's Internet address is www.atsdr.cdc.gov

02-0020-pm

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

Air Sampling and Modeling

Measuring and Estimating Levels of Air Pollution

Air samples are collected for different reasons but usually to find out:

- what pollutants are in the air, and
- what are the levels (or concentrations) of the pollutants found.

They do not necessarily tell us where the pollutants come from.

ATSDR uses air sampling results primarily to determine whether levels of pollution in the air that people breathe could be harmful to their health.

Just because people breathe air containing pollutants does not mean that people will get sick. In fact, typical levels of many air pollutants have absolutely no known health effects.

Illness can result depending on the level of contamination, duration of exposure, or pre-existing health conditions, such as asthma or Chronic Obstructive Pulmonary Disease (COPD).

Air samples can be collected in many places around or near a site. The goals of a sampling program determine where air samples are collected, as in the following examples.

- A research program on "background" levels of air pollution will usually collect samples at locations as far away from sources of air pollution as possible.
- Direction and force of prevailing winds may be a factor as to where sampling will take place.

ATSDR prefers to evaluate sampling results from areas where people live so that we will know exactly what is in the air that people breathe.

Measuring Devices

No single device can measure every air pollutant because each air pollutant is different.

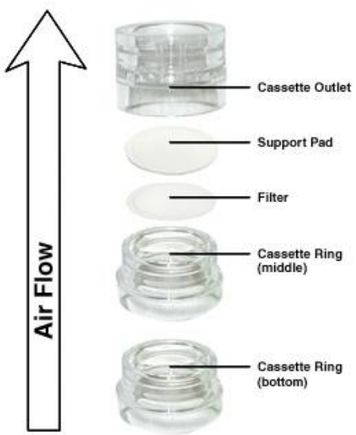
- Some pollutants are particles
- Some are gases
- Some pollutants break down in sunlight
- Some do not break down in sunlight
- Some pollutants react very quickly when they land on surfaces
- Some are very stable

Because each air pollutant is different, scientists have had to develop a wide range of equipment to measure air pollution. In fact, there are thousands of different devices that measure levels of air pollution.

Filter sampling and canister sampling are two of the most common approaches to measuring air pollution.

Filter sampling: Filter sampling is used to measure the amount of *particles* in the air. Samples are collected using devices that have filters with very small holes in them. As air flows through the device, gases will pass through the filter, but particles in the air are trapped. Laboratories can then find out what contaminants are in the particles and measure the amount of particles that landed on the filter.

Canister sampling: To measure *gases* in air, samples are often collected in small containers called canisters. A pump is used to pull air into the canister. After the sampling period is over, the canister is full of compressed air. A laboratory can then measure the amounts of gaseous pollutants in the canister.



Filter Sampling

Canister Sampling

Air Modeling

An air model is a mathematical tool that scientists use to understand how contaminants move in the air. In order to use an air model, scientists need data relevant to the area they are studying. Scientifically sound modeling can result in a better understanding of the overall exposure to specific contaminants.

Because extensive sampling data are not available for many sites, air models are the best tools available for estimating exposures to air pollution.

Air Models

- can be used to estimate a substance's concentration over different time frames, such as a given day or an entire year.
- can be used to estimate the level of multiple substances in the air as a result of emissions from a single source or multiple sources.
- can estimate a substance's concentration at a wide range of locations.
- can be used to estimate levels of air pollution in residential areas.
- can offer insights into where contaminants deposit in greatest quantities.
- can help identify areas where air sampling should take place.

ATSDR conducts a wide range of analyses with air models. For instance, air modeling is used to estimate the amount of contaminants in the air that people breathe, and the amount of contaminants that might have been deposited in the residential areas.

Models usually require inputs that describe the source of contamination and local weather conditions. Model outputs are estimates of levels of air pollution and the amount of air contaminants that might land on the ground. Though many models are quite advanced, none are perfect. Therefore, outputs from models should be viewed simply as estimates of actual conditions.

As a result ATSDR generally prefers to base conclusions on sampling data for measurements of what is in the air that people actually breathe.

It should be noted that even though a model may be used to measure a source-specific contaminant, there may be other sources of air pollution (such as motor vehicle traffic, airports, wind-blown dust, and burning) that may affect the result.

ATSDR's standard approach to modeling analyses is to first run the models, then critically review the results, and finally document our findings. All of our analyses are made available for public review and comment.