



Lab

Particulate Air Pollution

PURPOSE

- Measure particulate matter locally and evaluate the data by EPA standards

INTRODUCTION

Particulate matter is a term used to describe solid and liquid particles found suspended in the air. The particles have a wide variety of stationary and mobile sources and, therefore, a diverse set of physical and chemical properties. Particulate matter comprises a wide range of substances including road dust, wood smoke, fly ash, diesel soot, and sulfate aerosols. Most of these come from burning fossil fuels for transportation, power generation, and industrial boilers.

Particles in the air range in size, from smoke and soot particles that are dark and large enough to see to particles so small an electron microscope is needed. The smaller particles are the greater health hazard because they can penetrate more deeply into the respiratory tract. Since 1987 the EPA standard for particulate matter is PM-10, which includes particles with a diameter of 10 micrometers or less.

The major health problems from exposure to PM-10 are trouble with breathing, damage to lung tissue, cancer, and early death. The populations most affected by PM-10 are the very young, the elderly, and those with lung disease and asthma. New scientific evidence suggests that particles smaller than 2.5 micrometers can cause serious health problems. The World Health Organization (WHO) has done long-term studies that show the risk of premature death has a threshold of annual concentrations of PM-2.5 of 10 g/m^3 . The EPA is reviewing possible changes in the existing PM-10 standard.

Materials

- petri dishes (5)
- petroleum jelly
- hand lens (or low-power microscope)
- wax pencil or marker pen

Procedure

- Step 1** Write your name on the outside of five petri dish bottoms. Then, using a quarter as a guide, draw a circle on the inside bottom of the dishes.
- Step 2** Carefully smear a thin layer of petroleum jelly inside the circles you drew. Then quickly place the tops of the petri dishes over the bottoms to keep the petroleum jelly clean until you are ready to start your collecting.
- Step 3** Keep one petri dish as a control and place the others at various places around the school building and grounds. (If you want to try a few at other locations, discuss with your teacher.)
- Step 4** In your lab notes carefully describe the location of each petri dish and any factors that may affect your collecting. Hypothesize what your findings will be at each site, or at least rate the sites in order of the number of particles you expect to find.
- Step 5** Set your petri dishes out at the locations you selected and uncover them. After 24 to 48 hours retrieve the petri dishes by immediately covering them. Bring them back to the classroom or lab.
- Step 6** For your analysis, uncover a petri dish and using a hand lens or low-power microscope, count the actual number of particles you see caught in the petroleum jelly. Repeat this for all five dishes, including the control. Record the number of particles counted on your data sheet.
- Step 7** For each petri dish, try to identify the types of particles and their probable source.

Problems

3. Are the particles you found considered to be pollution? Why or why not?

4. Outline some procedures to reduce the amount of particulate matter in the areas tested.
