

What is Particulate Matter?

There are things floating around in the air. Most of them, you cannot even see. They are a kind of air pollution called particles or particulate matter. In fact, particulate matter may be the air pollutant that most commonly affects people's health.

Have a Look.

Particles can come in almost any shape or size, and can be solid particles or liquid droplets. We divide particles into two major groups. These groups differ in many ways. One of the differences is size, we call the bigger particles PM10 and we call the smaller particles PM2.5.

BIG. The big particles are between 2.5 and 10 micrometers (from about 25 to 100 times thinner than a human hair). These particles are called PM10 (we say "P M ten", which stands for Particulate Matter up to 10 micrometers in size). These particles cause less severe health effects.

SMALL. The small particles are smaller than 2.5 micrometers (100 times thinner than a human hair). These particles are called PM2.5 (we say "P M two point five", as in Particulate Matter up to 2.5 micrometers in size).

Where particulate matter comes from ...

Size isn't the only difference. Each type of particle is made of different material and comes from different places.

	Coarse Particles (PM ₁₀)	Fine Particles (PM _{2.5})
What they are	<ul style="list-style-type: none">• smoke, dirt and dust from factories, farming, and roads• mold, spores, and pollen	<ul style="list-style-type: none">• toxic organic compounds• heavy metals
How they're made	crushing and grinding rocks and soil then blown by wind	<ul style="list-style-type: none">• driving automobiles• burning plants (brush fires and forest fires or yard waste)• smelting (purifying) and processing metals

These particles get around.

Which particles do you think travel farther?

PM₁₀ (big) **OR** PM_{2.5} (small)

How far do you think PM₁₀ particles can travel?

100 feet 25 miles 500 miles

How far do you think PM_{2.5} particles can travel?

100 feet 25 miles 500 miles

The smaller particles are lighter and they stay in the air longer and travel farther. PM10 (big) particles can stay in the air for minutes or hours while PM2.5 (small) particles can stay in the air for days or weeks. And travel? PM10 particles can travel as little as a hundred yards or as much as 30 miles. PM2.5 particles go even farther; many hundreds of miles.

Particulate Matter and Your Health

Getting into your body.

When you inhale, you breathe in air along with any particles that are in the air. The air and the particles travel into your respiratory system (your lungs and airway). Along the way the particles can stick to the sides of the airway or travel deeper into the lungs.

The farther particles go, the worse the effect.

Which particles can go farther into the lungs?

PM₁₀ (big) **OR** PM_{2.5} (small)

Answer: the smaller PM2.5 particles. Smaller particles can pass through the smaller airways. Bigger particles are more likely to stick to the sides or get wedged into one of the narrow passages deep in the lung.

Other factors that affect how deep into the lungs particles can go:

- **Mouth or nose breathing.** Breathing through your mouth allows particles to travel deeper into your lungs.
- **Exercise.** While exercising, particles can travel deeper.
- **Age.** Older people breathe less deeply so particles may not get as deep.
- **Lung disease.** If lung disease causes shallow breathing, particles will remain in the upper sections of the airways and lung.
- **Weather** (temperature).
- **Other pollutants in the air.**

Your body responds to the particulate invasion!

Your lungs produce mucous to trap the particles, and tiny hairs wiggle to move the mucous and particles out of the lung. You may notice something in the back of your throat (this is

the mucous); the mucous leaves the airway by coughing or swallowing. If the particle is small and it gets very far into the lungs, special cells in the lung trap the particles and then they can't get out and this can result in lung disease, emphysema, lung cancer.

Health Effects

Both PM10 (big) and PM2.5 (small) particles can cause health problems; specifically respiratory health (that's the lungs and airway). Because the PM2.5 **travels deeper** into the lungs AND because the PM2.5 is made up things that are **more toxic** (like heavy metals and cancer causing organic compounds), PM2.5 can have worse health effects than the bigger PM10.

Exposure to particulate matter leads to increased use of medication and more visits to the doctor or emergency room. Health effects include the following:

- Coughing, wheezing, shortness of breath
- Aggravated asthma
- Lung damage (including decreased lung function and lifelong respiratory disease)
- Premature death in individuals with existing heart or lung diseases

Particulate Matter -- Air Quality Index (AQI) and Health Concerns

AQI Values	Air Quality Descriptor	Health Concerns*	
		PM _{2.5}	PM ₁₀
0 - 50	Good	None	None
51 - 100**	Moderate	None	None
101 - 150	Unhealthy for Sensitive Groups	People with respiratory or heart disease, the elderly, and children should limit prolonged exertion.	People with respiratory disease, such as asthma, should limit outdoor exertion.
151 - 200	Unhealthy	People with respiratory or heart disease, the elderly, and children should avoid prolonged exertion; everyone else should limit prolonged exertion.	People with respiratory disease, such as asthma, should avoid outdoor exertion; everyone else, especially the elderly and children, should limit prolonged outdoor exertion.

201 - 300	Very Unhealthy	People with respiratory or heart disease, the elderly, and children should avoid any outdoor activity; everyone else should avoid prolonged exertion.	People with respiratory disease, such as asthma, should avoid any outdoor activity; everyone else, especially the elderly and children, should limit outdoor exertion.
301 - 500	Hazardous	Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly, and children should remain indoors.	Everyone should avoid any outdoor exertion; people with respiratory disease, such as asthma, should remain indoors.

* PM has two sets of cautionary statements, which correspond to the two sizes of PM that are measured:

- Particles up to 2.5 micrometers in diameter (PM_{2.5})
- Particles up to 10 micrometers in diameter (PM₁₀)

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- An AQI of 100 for PM_{2.5} corresponds to a PM_{2.5} level of 35 micrograms per cubic meter (averaged over 24 hours).
- An AQI of 100 for PM₁₀ corresponds to a PM₁₀ level of 150 micrograms per cubic meter (averaged over 24 hours).