INTER-AMERICAN AIR QUALITY DAY

8 AUGUST 2003

LET’S PROTECT OUR CHILDREN

LET’S CLEAN THE AIR
Introduction

More than 30 million children in Latin America and the Caribbean breathe unhealthy air. If you live or work in a polluted area or environment, you might know a child affected by dirty air. Common symptoms are soreness in the chest, tearful eyes, coughing, and headaches.

According to health professionals, children are more susceptible to air pollution than adults because:

😊 **They are more exposed:** Children take in more air in proportion to their bodyweight and lung size and spend more time outdoors than adults do.

😊 **They are more vulnerable:** Children’s bodies are developing and are more susceptible to irritations and illnesses.

Some studies have shown that children living in polluted areas or environments are more susceptible to respiratory infections. Although symptoms may not be apparent, they have higher probability of suffering damages that may cause losses in lung function, increasing the risk of respiratory diseases in adulthood.

The Inter-American Air Quality Day, celebrated on 8 August 2003, is an opportunity to promote healthy air for children, showing the hazards of air pollution and their impact on children’s health, and simple measures to reduce or eliminate them. We welcome your participation in this initiative!
Let’s clean the air

1. Poor air quality. Why?

The air we breathe is mainly composed of nitrogen and oxygen. It contains also small quantities of other gases such as carbon dioxide, argon, neon, helium, hydrogen, and methane, and a variable amount of water vapor.

Air composition is modified by particles and gases generated by human activities, primarily the burning of fossil fuels, such as petroleum, and the industrialization of chemical products. When the changes reach levels that are hazardous to human health, other aspects of well-being, and the environment, we are confronted with air pollution. The most common pollutants released into the air or formed within it are carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen oxides (NOₓ), volatile organic compounds (VOC), ground-level ozone (O₃), and solid and liquid suspended particles, including heavy metals such as lead.

Carbon monoxide (CO)

CO is a colorless and odorless gas. The main human activity that generates CO is the incomplete burning of fossil fuels, such as gasoline. It can be especially hazardous in cities where the use of old and poorly maintained vehicles, intense traffic, and vehicle congestion are prevalent. This gas may also be hazardous in enclosed environments that are poorly ventilated.

Sulfur dioxide (SO₂)

SO₂ is a colorless gas generated by the burning of sulfur. The main activities that generate SO₂ are the burning of fossil fuels and the smelting of minerals with high sulfur content.
Nitrogen oxides (NO\textsubscript{x})

The main human activity that generates NO\textsubscript{x} is fuel burning at high temperatures. Major NO\textsubscript{x} sources include the exhaust pipes of motor vehicles in circulation and the stacksoffossil-fueledpowerplantsinoperation.

Volatile organic compounds (COV)

VOC are organic substances, such as benzene and acetaldehyde, which readily evaporate at temperatures lower than their boiling points. Major VOC sources include the burning and evaporation of fossil fuels and organic solvents and the emissions generated by chemical product manufacturing.

Ground-level ozone (O\textsubscript{3})

Ground-level ozone is a secondary pollutant formed by a complex series of chemical reactions of NO\textsubscript{x} and VOC in the presence of sunlight. The variations of O\textsubscript{3} concentrations in a particular location depend on several factors including the concentrations of NO\textsubscript{x} and VOC in the air, intensity of sunlight, weather conditions, and topography.

Suspended particles

Suspended particles such as ash and dust are usually classified according to their size. Coarse particles are generated by mechanical means and are typically fragments of some larger solid particles, whereas fine particles are generated by physicochemical processes, such as condensation and chemical transformation of gases. In homes, the main activity that generates suspended particles is the burning of wood, coal, dung, and kerosene for cooking or heating.
Lead

Lead is a heavy metal usually released into the air as particles. One of its main sources is the use of leaded gasoline in motor vehicles.

2. How does air pollution affect children’s health?

Three conditions should be considered to answer this question:

1. General health conditions;
2. Pollutant type and concentration; and
3. Exposure time to contaminated air.

Lungs are very complex organs containing more than 40 different kinds of cells. Air pollution can change the cells in the lung by damaging those that are most susceptible. If the cells that are damaged are important in the development of new functional parts of the lung, then the lung may not achieve its full growth and function as a child matures to adulthood.

The incidence of asthma and other respiratory diseases in children such as allergic reactions, bronchitis, and acute respiratory infections have increased significantly in the past years. Air pollution may be one of the causes.

Each pollutant has different effects on children’s health:

Carbon monoxide (CO)

When inhaled, CO reacts very rapidly with hemoglobin in the blood and forms carboxyhemoglobin, decreasing the oxygen delivery to vital organs such as the heart and the brain.
The severity of symptoms depends on the percentage of hemoglobin that converts to carboxyhemoglobin. After exposures that convert 5 to 10% of the hemoglobin to carboxyhemoglobin, the child may react more slowly to external stimuli. At 10 to 30 percent carboxyhemoglobin, nausea, headaches, unconsciousness and sometimes death can result. Carbon monoxide may also have prenatal effects. Pregnant women who are exposed to high levels of CO are at increased risk of having low birth-weight babies.

**Sulfurdioxide (SO₂)**

SO₂ is a very water-soluble gas and therefore most of the SO₂ that is inhaled is absorbed in the upper respiratory tract provoking nose and throat irritation. However, small quantities of SO₂ in the alveoli (the deepest part of the lungs) can provoke important health effects, primarily in children with asthma.

**Ozone (O₃)**

O₃ is an oxidant that can penetrate the deepest regions of the respiratory system provoking the following symptoms:

- **Nose and throat irritation.**
- **Increased production of mucous and tendency to cough.**
- **Eye irritation and headaches.**
- **During severe pollution episodes, soreness in the chest and difficulty to breathe deeply without coughing.**

Let’s protect our children
Nitrogen oxides (NO\textsubscript{x})

Nitrogen dioxide is the most important NO\textsubscript{x} compound with respect to adverse health effects. Under most chemical conditions it is an oxidant, as is ozone. However, it differs from ozone in that it suppresses the immune system to a much greater degree.

Several studies have shown that children under 5 years of age exposed to high levels of nitrogen dioxide are more susceptible to respiratory infections and allergic disorders.

Volatile organic compounds (VOCs)

VOCs may cause different adverse health effects in children. For example, several VOCs, such as benzene, are carcinogenic. Others, such as acetaldehyde, may irritate the respiratory tract.

Suspended particles

In general, it is difficult to assign a quantitative risk associated with particulate matter because nearly all studies of its health effects find the presence of other pollutants that may account for several of the effects. However, the exposure to this contaminant has been associated with the following outcomes:

- Increased hospital admissions of children with acute respiratory symptoms.
- Increased school and kindergarten absences.
- Increased medication use in children with asthma.

According to several research studies, children with asthma living in a community with high particle concentrations may have suppressed lung growth. After children moved into cleaner cities, their lung growth returned to the normal rate, but they did not recover the lost potential growth.

Lead

Lead causes kidney and nerve damage and impairs the body ability to produce hemoglobin. Lead is often measured in children's blood as an index of environmental exposure. Several studies have shown that even low levels of lead in the blood of children aged 6-7 years old are linked to measurable decreases in intelligence quotient.
3. **How can we protect our children?**

To protect our children, we should be aware of the air quality in our community and consider the following suggestions:

**Help our children to breathe clean air**

- Don't smoke and don't let others smoke in your home or car.

- Keep your home as clean as possible. Dust, mold, certain household pests, secondhand smoke, and pet dander can trigger asthma attacks and allergies.

- Prevent children from being in closed environments where kitchens or stoves are in use.

- Limit outdoor activity on alert days when air pollution is especially harmful.

- Walk, use bicycles, join or form carpools, and take public transportation.

- Limit motor vehicle idling.

- Avoid open burning.

**Protect our children from lead poisoning**

- Get kids tested for lead by their doctor or healthcare provider.

Let’s protect our children
Wash children's hands before they eat; wash bottles, pacifiers, and toys often.

Wash floors and window sills to protect kids from dust and peeling paint contaminated with lead, especially in older homes.

Avoid using aerosols

Use baits and traps when you can; place baits and traps where kids can't get them.

Protect our children from carbon monoxide (CO) poisoning

Have fuel-burning appliances, furnace flues, and chimneys checked once a year.

Never use gas ovens or burners for heat; never use barbecues or grills indoors or in the garage.

Never sleep in rooms with un-vented gas or kerosene space heaters.

Don't run cars in the garage.
4. Frequently asked questions

What is the composition of air?

The air we breathe is mainly composed of nitrogen (78%) and oxygen (21%). It also contains small quantities of carbon dioxide, other gases, and water vapor.

When do we say that the air is polluted?

We say that the air is polluted when its composition has been altered and reaches levels hazardous to human health, other aspects of human well-being, and the environment.

Why are children one of the most sensible populations to polluted air?

They are more sensible because they have greater exposure and vulnerability. They take in more air in relation to their bodyweight and lung size. Besides, they spend more time outdoors, their bodies are still developing, and are more susceptible to irritations and illnesses.

What are the most common air pollutants and how are they produced?

Carbon monoxide (CO); sulfur dioxide (SO₂); nitrogen oxides (NOₓ); volatile organic compounds (VOCs); ground-level ozone (O₃); and suspended particles,
including heavy metals as lead, are the most common air pollutants. They are generated mainly by the burning of fossil fuels and the production of chemical products.

**How do air pollutants affect children’s health?**

Health effects will depend on general health conditions, pollutant type and concentration, and exposure time. Pollutants may irritate the skin, eyes, and respiratory tract; cause kidney and nerve damage; reduce oxygen intake capacity; and produce cancer.

**What can we do to protect our children from air pollution?**

- Let´s be informed.
- Let´s take preventive actions.
- Let´s follow the tips included in this guide.