United States
Environmental Protection
Agency

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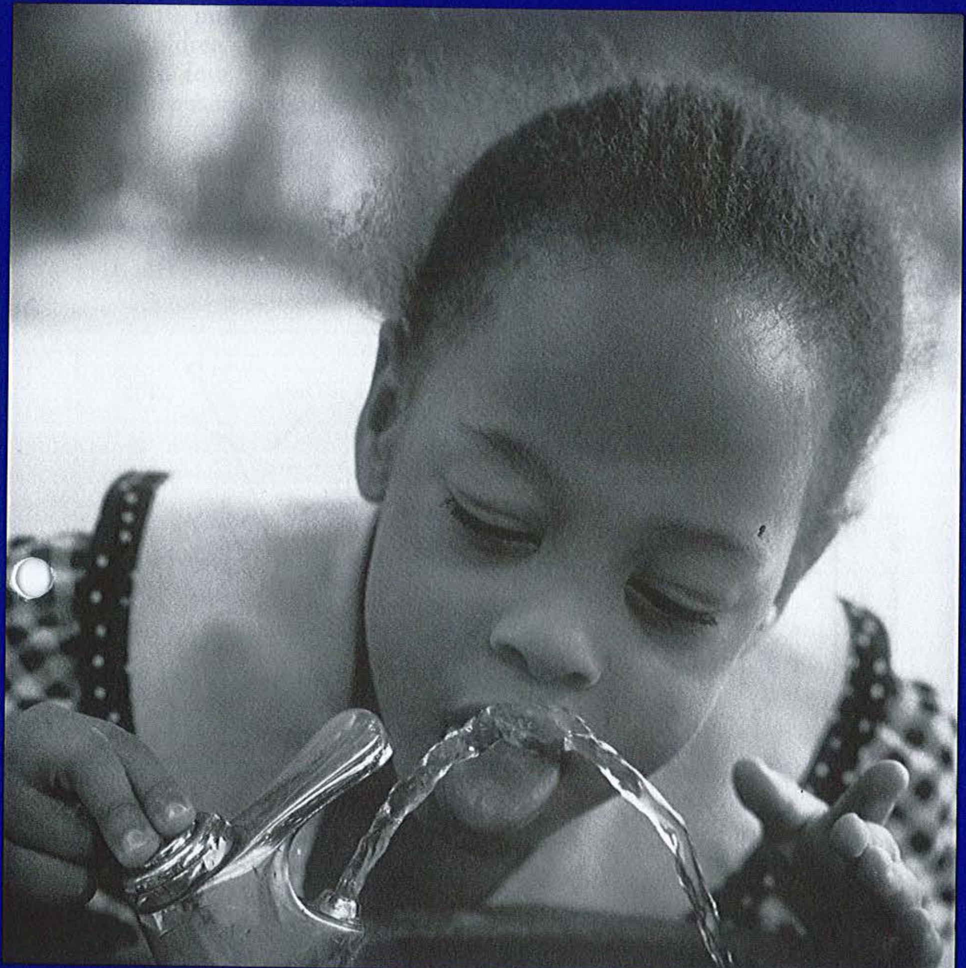
International Activities

(2670R)

EPA

Reducing Health Risks Worldwide

EPA's International Lead Risk Reduction Program

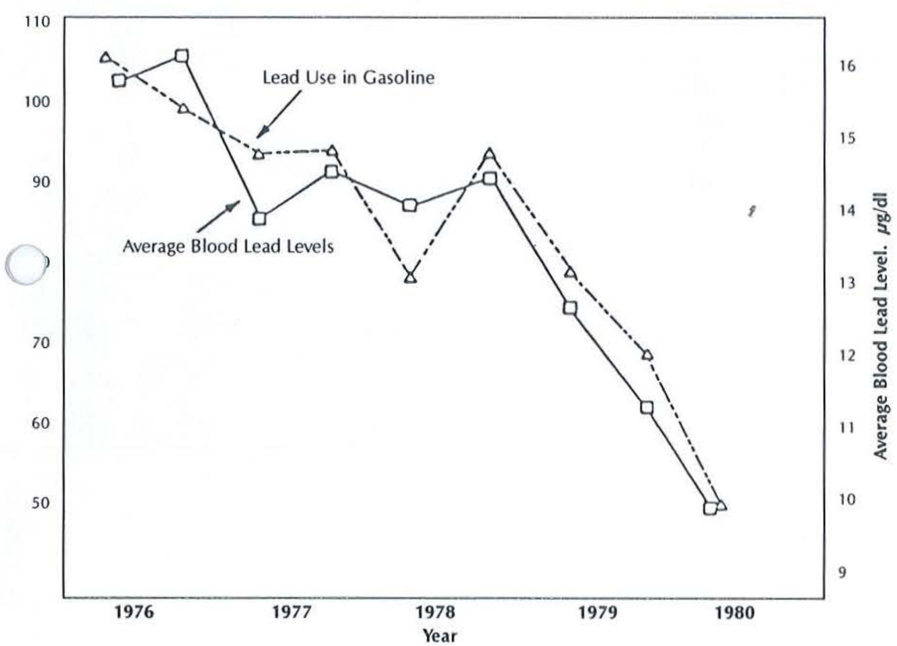


Introduction

Exposure to lead is one of the most significant yet preventable threats to human health in the world today. Lead has no known benefits to human health and can adversely affect the neurological system, the kidneys and the cardiovascular system. While all individuals are susceptible to lead's effects, the low body weight and maturing neurological systems of children make them particularly vulnerable. Children exposed to even low levels of lead may suffer reductions in IQ and develop learning disabilities. Research indicates that each 10 microgram/deciliter increase in children's blood levels results in a two to four point drop in IQ. Persistent exposure to lead can increase the number of mentally retarded children in a society and reduce the number of children with superior intelligence.

Lead exposure is an age-old problem that persists to this day. Lead has long been used in pottery, plumbing and other applications that benefit from the heavy metal's malleability and resistance to corrosion. Historians speculate that the use of lead created severe public health problems in ancient Roman society. Today, despite extensive evidence documenting its health impacts, lead continues to be used. Lead is found in gasoline and paint, and is released from lead smelters and battery recovery

Blood lead levels in children correspond closely to the amount of lead used in gasoline.
Source : ATSDR, 1988
"The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress"



operations. While any source of lead exposure is of concern, the use of the heavy metal in gasoline contributes 95 percent of the lead air pollution found in the world's major cities. Such pollution can create problems far from the point of origin. Lead particles in air cross national boundaries to settle in distant waters or soils, while lead-containing items, such as canned foods and pottery, cross national lines through international trade.

Since lead pollution is a problem with significant transboundary dimensions, an international approach can improve the effectiveness of national lead abatement programs. By sharing two decades of experience with lead risk management, the United States can help other countries reduce lead-related hazards. Environmental Protection Agency Administrator Carol Browner spearheaded the call for a global phase-out of leaded gasoline at the 1994 meeting of the UN Commission for Sustainable Development. Led by the Office of International Activities, with assistance from other EPA offices and regions, the International Lead Risk Reduction Program is a response to the Administrator's call.

The U.S. Experience

The United States began phasing lead out of gasoline in the 1970s, when catalytic converters were introduced as a way of curtailing automobile tailpipe emissions. Since catalytic converters cannot be used with leaded fuel, laws mandated the sale of unleaded gasoline. Limits on the allowable lead content in gasoline took effect in 1979, and the U.S. adopted a nationwide ban on lead in gasoline in 1996. The U.S. has also controlled the use of lead in paint, plumbing materials and food-can solders. Lead poisoning from plumbing and peeling paint in older houses continues to be a problem, as does lead from imported pottery and food.

The U.S. has seen a dramatic decline in children's blood lead levels that corresponds closely to the decreasing lead content of its gasoline. The percentage of American children aged 0 to 5 years with blood lead levels 10 $\mu g/dL$ or greater decreased from 88.2 percent to 8.9 percent in the years following the start of leaded gas phase-out.

While moving from leaded to unleaded gasoline did require initial investments in changing refinery technology, moving to new gasoline additives and educating the public, the economic benefits of phasing out lead have far outweighed the costs. Estimates suggest that, due to lower health care costs, better fuel efficiency, and savings on engine maintenance, the United States has saved over $10 for every $1 invested in removing lead from gasoline.

The U.S. has considerable experience in reducing use of leaded gasoline.

Water from lead or lead-soldered plumbing can be a source of lead exposure.

Lead pollution is a serious concern in most of the world's major cities.

Lead on the Global Agenda

EPA leadership has helped make lead risk reduction a global priority. Although there is no binding international agreement to reduce the use of lead, there are many national and regional commitments.

- In December 1994, at the Summit of the Americas, heads of state from a number of countries pledged to develop national action plans for the phase-out of leaded gasoline in the Western Hemisphere. Following up on this high-level meeting, EPA and the Mexican Secretariat of Environment, Natural Resources and Fisheries hosted an international workshop that helped convince many nations to aggressively pursue the phase-out of leaded gasoline. Approximately 80 representatives from more than 25 nations, international organizations and industry associations met to discuss rationales and incentives, identify the national actions needed and highlight available technologies and techniques. Following the workshop, many countries announced plans to reduce use of leaded gasoline.
- In May 1996, the World Bank called for a global phase-out of leaded gasoline and offered to help countries design feasible phase-out schedules and incentive frameworks. The World Bank also offered to broker financial arrangements to help countries achieve lead phase-out. The EPA and the World Bank have committed to coordinating their activities in this area.
- A key recommendation of the Third "Environment for Europe" Ministerial Conference held in Sofia, Bulgaria in October 1995 called for the reduction and ultimate phase-out of lead in gasoline.
- In February 1996, Environment Ministers from member nations of the Organization for Economic Cooperation and Development adopted a Declaration on Risk Reduction for Lead to advance national and joint efforts to reduce risks from lead exposure.
- In June 1996, the second United Nations Conference on Human Settlements, called Habitat II, included the elimination of lead from gasoline as a goal in its agenda.
- In May 1997, environmental ministers from the Group of Seven plus Russia endorsed the phase-out of leaded gasoline in the 1997 Declaration of Environmental Leaders of the Eight on Children's Environmental Health. The ministers also called for countries to reduce blood lead levels in children to below 10 $\mu g/dL$, a very stringent level, and committed to undertaking public awareness campaigns on the health risks to children.

EPA Program Areas

The central goal of the EPA's International Lead Risk Reduction Program is to minimize the health harms associated with lead exposure on a global level. To accomplish this goal, EPA works in three program areas.

Developing National Strategies on Lead

Working with decision-makers around the world, EPA has prompted many countries to commit to lead phase-out.

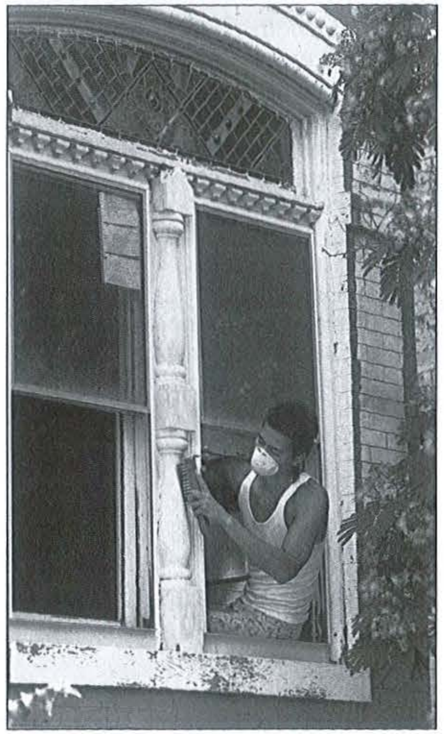
EPA also assists countries in developing and implementing phase-out programs once a policy commitment has been made. A critical component of EPA's work on lead is a training workshop that was developed in cooperation with the World Health Organization, the World Bank and others.

Delivery of the EPA workshop in Argentina, Ecuador, and Jamaica included participants from over twenty-five countries in Central and South America. Using strategies discussed in the workshop, many participating countries have subsequently moved forward on lead phase-out.

EPA also hosted China's chief mobile sources official for a three-month tour

> **Across this planet, in nation after nation, we are recognizing that removing lead from gasoline is a common-sense, cost-effective measure that is good for our children, good for public health, good for the economy, and good for the environment.**
>
> *—Carol M. Browner*

to meet regulators and private companies, and presented the lead workshop in the Chinese cities of Shanghai and Xiamen. China has subsequently credited U.S. government agencies, including EPA, with having played a key role in its decision to achieve lead phase-out by the year 2000. Three major cities in China have already phased out leaded gasoline. Vice President Gore has praised China's decision as one of the most cost-effective steps the Chinese government can take to protect children's health.



Removing lead-based paint can be difficult and hazardous.

Supporting Regional Efforts

Recognizing the transboundary nature of lead pollution, EPA supports regional efforts to reduce lead risks. For example, EPA funds activities through Budapest's Regional Environment Center to encourage lead phase-out in Central and Eastern Europe. Countries in this region, including Bulgaria, Hungary, Slovakia, the Czech Republic, Slovenia, and Poland, are working under an initiative of the Sofia Conference to address leaded gasoline and other air quality issues. EPA has also helped merge the efforts of the Sofia Conference Initiative with those of the United Nations Economic Commission for Europe to achieve a pan-European lead phase-out. Both groups are now working on a proposal for a European Strategy on removing lead from gasoline which will be submitted to the next European Ministerial Conference.

Piloting Research

By piloting innovative research projects, EPA helps develop scientific models and policy approaches for lead phase-out that can subsequently be used by many countries, including the United States.

In Brazil, EPA has initiated a lead inventory project through a cooperative agreement with the Pan-American Health Organization (PAHO). This project seeks to identify and prioritize sources of lead exposure beyond gasoline as part of an action plan to

address multiple sources of lead exposure. The inventory methodology used in the Brazil project can serve as a model for other countries interested in developing a comprehensive lead strategy.

In another project, EPA completed an assessment of strategies for controlling mobile source air pollutants, including lead, for Egypt. EPA is also working with two communities in Romania that, due to industrial activity, have large populations of children with extremely elevated blood-lead levels. EPA provides technical support and training to help in the development of plans for the remediation of contaminated soil. The Agency is interested in piloting these low-cost options to demonstrate their potential use in the U.S.

Under the auspices of the Gore-Chernomyrdin Commission, EPA worked closely with the Centers for

PHASING LEAD OUT OF GASOLINE: NATIONAL ACTIONS SINCE 1994

Total Phaseout	Initiatives Toward Phaseout	Started Work on Phaseout
Antigua	Barbados	Belize
Argentina	Belgium	Bolivia
Brazil	China	Bulgaria
Colombia	Czech Republic	Chile
Costa Rica	Egypt	Ecuador
El Salvador	India	European Union
Guatemala	Indonesia	Hungary
Malaysia	Iran	Paraguay
Nicaragua	Israel	Poland
Slovakia	Jamaica	Romania
South Korea	Mexico	Russia
Sweden	Morocco	Slovenia
Thailand	New Zealand	Surinam
USA	Norway	
	Peru	
	Philippines	
	South Africa	
	Taiwan	
	Zimbabwe	

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Disease Control on a survey of children's blood-lead levels in the Russian city of Saratov. The project establishes a base line for measuring results once abatement activities are undertaken. As the first evaluation of pediatric blood-lead levels ever done in Russia, the Saratov study was so successful that it is being replicated in other Russian cities.

Conclusion

The international community has made enormous progress over the last several years in reducing lead risks worldwide. Recognizing the opportunity to achieve significant health and economic benefits, many nations have made the necessary commitments to lead phase-out. EPA's International Lead Risk Reduction Program has played an important role in this global effort.

Automobiles that use leaded gasoline are the largest source of lead in air pollution.

Photos in this booklet by Steve Delaney

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

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EPA

Latest Findings on National Air Quality: 1997 Status and Trends

2 LEAD (Pb)

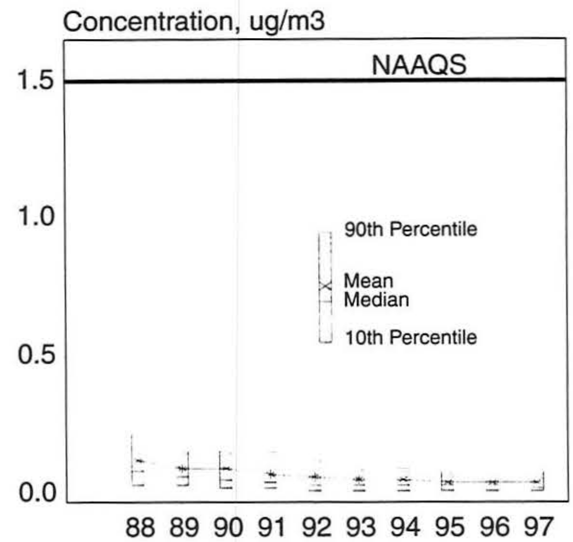
Nature and Sources of the Pollutant: In the past, automotive sources were the major contributor of Pb emissions to the atmosphere. As a result of EPA's regulatory efforts to reduce the content of Pb in gasoline, the contribution from the transportation sector has declined over the past decade. Today, metals processing is the major source of Pb emissions to the atmosphere. The highest air concentrations of Pb are found in the vicinity of nonferrous and ferrous smelters, and battery manufacturers.

Health and Environmental Effects: Exposure to Pb occurs mainly through inhalation of air and ingestion of Pb in food, water, soil, or dust. It accumulates in the blood, bones, and soft tissues. Lead can adversely affect the kidneys, liver, nervous system, and other organs. Excessive exposure to Pb may cause neurological impairments, such as seizures, mental retardation, and behavioral disorders. Even at low doses, Pb exposure is associated with damage to the nervous systems of fetuses and young children, resulting in learning deficits and lowered IQ. Recent studies also show that Pb may be a factor in high blood pressure and subsequent heart disease. Lead can also be deposited on the leaves of plants, presenting a hazard to grazing animals.

Trends in Pb Levels: Between 1988 and 1997, ambient Pb concentrations decreased 67 percent, and total Pb emissions decreased 44 percent. Since 1988, Pb emissions from highway vehicles have decreased 99 percent due to the phase-out of leaded gasoline. The large reduction in Pb emissions from

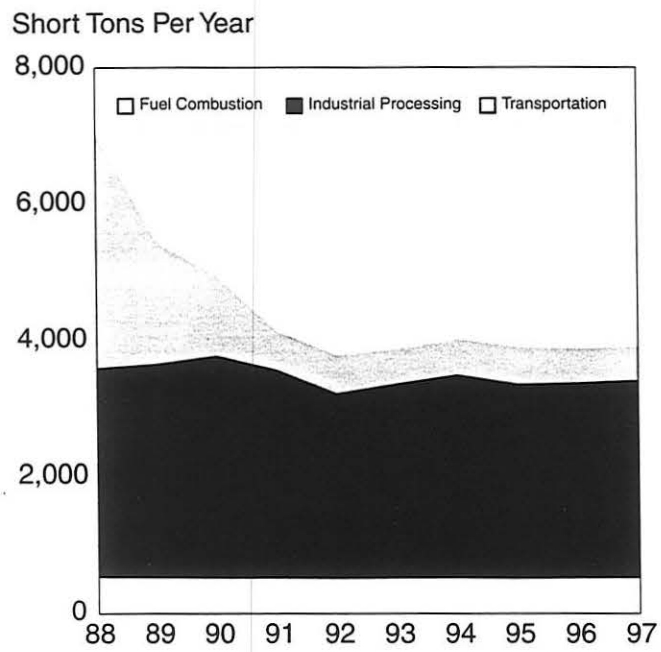
transportation sources has changed the nature of the pollution problem in the United States. While there are still violations of the Pb air quality standard, they tend to occur near large industrial sources such as lead smelters. Between 1996 and 1997, Pb concentrations and emissions remained unchanged.

Lead (Pb) Air Quality, 1988-97
Annual Maximum Quarterly Average
1988-97: 67% decrease
1996-97: no change



Bold line indicates national air standard.

Lead (Pb) Emissions, 1988-97
1988-97: 44% decrease
1996-97: no change



"REVIEW OF STUDIES ADDRESSING LEAD ABATEMENT EFFECTIVENESS"

EPA Report No. 747-R-95-006 (July, 1995)
Full report available by calling 1-800-424-LEAD

Executive Summary

INTRODUCTION

This report is a comprehensive review of the scientific literature regarding the effectiveness of lead hazard intervention. One use of this review is to aid in assessing the potential benefits of Title X rule-making activities. In this report, a lead hazard intervention is defined as any non-medical activity that seeks to prevent a child from being exposed to the lead in his or her surrounding environment. An intervention, therefore, may range from the in-home education of parents regarding the dangers of a young child's hand-to-mouth activity to the abatement of lead-based paint. Interventions include activities that attempt to remove or isolate a source of lead exposure, as well as activities that attempt to reduce a child's lead exposure by modifying parental or child behavior patterns.

A number of studies have examined the effectiveness of abating the environment of lead hazards associated with lead-based paint, elevated dust leads, and elevated soil lead. These studies have emphasized hand-to-mouth activity as the primary pathway of childhood lead exposure and utilized interventions that targeted this pathway. Generally, they have assessed whether a particular intervention strategy effectively lowered an affected child's body-lead burden or the levels of lead in his or her environment. Sixteen such studies are summarized in this report. In total, these studies spanned 13 years, from 1981 to 1994. In all 16 cases, the interventions targeted primarily the child's residential environment. Also, the studied interventions principally sought "secondary" rather than "primary" prevention (e.g., assessing the effectiveness of lead hazard intervention on already exposed rather than unexposed children). Ten of the 16 studies focused on the abatement of lead-based paint as a primary form of intervention, five studies focused on dust or educational intervention, and one study focused on soil abatement.

It is often infeasible to directly assess health benefits following an intervention because many such benefits are subtle and, as such, are complicated and costly to measure directly. In this report, therefore, the blood-lead concentrations of exposed children are utilized as the primary measure of intervention efficacy. Blood-lead concentration can serve as a good surrogate health endpoint due to the established association between elevated blood-lead levels and adverse health effects.

MAJOR FINDINGS

The literature is very limited in its extent. However, it does indicate that blood-lead concentrations declined after lead hazard intervention, at least for children with blood-lead levels above 20 µg/dL.

The available literature only covers some of the intervention types and methods used in practice. However, declines on the order of 18-34% were measured in exposed children's blood-lead levels 6 to 12 months following a variety of intervention strategies. The evidence for blood-lead concentration declines after intervention among children with pre-intervention levels less than 20 µg/dL is mixed. With respect to changes in dust lead levels after intervention, dust lead level declines following intervention were larger than the blood lead declines. However, dust levels are of limited relevance as a measure of actual exposure or health effects.

Four of the identified studies also simultaneously traced changes in blood-lead concentration among a population of children not receiving the studied intervention strategy. The effect of their interventions may then be estimated as the difference in the decline recorded for the study population and that for the "control" population. The four studies examined distinct intervention strategies: the abatement of damaged lead-based paint, the abatement of soil at elevated lead levels, regular dust control measures, and in-home educational outreach efforts. Using this measure, these four studies each would estimate the effect of their intervention to be approximately 15%. That is, those receiving the intervention were better off than those receiving partial or no interventions.

The evidence clearly indicates that short-term increases in exposed children's blood-lead concentrations may result when abatements are performed improperly.

Declines in blood-lead concentrations followed several removal methods, as well as some encapsulation and enclosure methods. In contrast, dry scraping and sanding without HEPA vacuum attachments as well as open-flame burning of lead-based paint were both reported to produce considerable elevations in the blood-lead levels of exposed children.

Failure to clean up post-abatement debris was also associated with residential dust and blood lead elevations.

There is simply insufficient information available to identify a particular intervention strategy as markedly more effective than others.

Evolution in the techniques associated with lead hazard control make comparison of the effectiveness of different practices difficult. The literature cites comparable reductions in blood-lead concentration resulting from the abatement of lead-based paint, dust at elevated lead levels, and soil at elevated lead levels. Moreover, declines in blood-lead levels after in-home educational efforts were observed in the same range as the other interventions, at least up to one year following intervention. As for long term effectiveness, there is virtually no data on the effectiveness of any lead hazard intervention beyond one year following intervention.

Information is especially lacking on the effectiveness of interventions for children with blood-lead concentrations below 20 µg/dL. Also missing is data on effectiveness beyond one year after intervention and on the efficacy achieved by trying to prevent elevated blood-lead concentrations before they occur.

DISCUSSION

When considering the effectiveness of an intervention, it is important to recognize that childhood lead exposure stems from a number of media (e.g., paint, soil, interior house dust, exterior dust) across a range of environments (e.g., child's residence, school, playground, friend's residence). Unless an intervention targets all the sources of a child's lead exposure, therefore, even an intervention that fully abates the targeted source will not produce a 100% decline in the child's blood-lead concentration. If other sources of lead remain unaffected by the intervention, lead exposure may continue and the child's blood-lead concentration may remain elevated.

Another factor, bone lead mobilization, can also cause blood-lead concentrations to remain elevated following interventions that reduce the targeted lead exposure. An intervention which reduces a child's lead exposure results in the mobilization of bone-lead stores into the blood. The available scientific information on bone lead mobilization is minimal, but a simple model of this mobilization was constructed in an effort to assess its impact. Bone lead mobilization modelling results in this report suggest that observed declines of as little as 25% in a child's blood-lead concentration might be possible for 6 months following an intervention which completely eliminates new lead exposure. The results also suggest that 25% declines in blood-lead concentrations which are observed at least 12 months after an intervention indicate the intervention was less than 100% effective in reducing the child's total lead exposure. However, mobilization of bone-lead stores is another reason why prevention of lead poisoning before it ever occurs is important.

Finally, in planning future studies of lead hazard intervention effectiveness, the timing of post-intervention measurements should be carefully considered. Environmental and blood-lead measurements taken one year after intervention are usually appropriate because both seasonal variability and the effects of bone-lead mobilization are minimized. The timing of earlier measures should be based on such factors as the importance of observing transient elevations in blood-lead concentrations should they occur shortly after intervention, the importance of establishing a baseline for assessing recontamination of environmental media, and a trade-off between the effects of seasonal variability and bone-lead mobilization. Consideration should also be given to the population of children examined by future studies. There is a particular lack of information on the effectiveness of lead hazard intervention among children with blood-lead concentrations at or below 20 µg/dL. Absent too is information on effectiveness at time periods beyond one year and on the efficacy achieved by preventing elevated blood-lead concentrations before they occur. Fortunately, some on-going intervention studies are examining these populations, and should provide valuable information.

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Title 40, Part 50 of the Code of the Federal Regulations lists the ambient air quality standard for nitrogen dioxide.

SULFUR DIOXIDE

High concentrations of sulfur dioxide (SO2) affect breathing and may aggravate existing respiratory and cardiovascular disease. Sensitive populations include asthmatics, individuals with bronchitis or emphysema, children and the elderly. SO2 is also a primary contributor to acid deposition, or acid rain, which causes acidification of lakes and streams and can damage trees, crops, historic buildings and statues. In addition, sulfur compounds in the air contribute to visibility impairment in large parts of the country. This is especially noticeable in national parks.

Ambient SO2 results largely from stationary sources such as coal and oil combustion, steel mills, refineries, pulp and paper mills and from nonferrous smelters. There are three NAAQS for SO2:

- an annual arithmetic mean of 0.03 ppm (80 ug/m3);
- a 24-hour level of 0.14 ppm (365 ug/m3); and
- a 3-hour level of 0.50 ppm (1300 ug/m3).

The first two standards are primary (health-related) standards, while the 3-hour NAAQS is a secondary (welfare-related) standard. The annual mean standard is not to be exceeded, while the short-term standards are not to be exceeded more than once per year.

Title 40, Part 50 of the Code of the Federal Regulations lists the ambient air quality standard for sulfur dioxide.

PARTICULATE MATTER

Air pollutants called particulate matter include dust, dirt, soot, smoke and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activity, fires and natural windblown dust. Particles formed in the atmosphere by condensation or the transformation of emitted gases such as SO2 and VOCs are also considered particulate matter.

Based on studies of human populations exposed to high concentrations of particles (sometimes in the presence of SO2) and laboratory studies of animals and humans, there are major effects of concern for human health. These include effects on breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular disease, alterations in the body's defense systems against foreign materials, damage to lung tissue, carcinogenesis and premature death. The major subgroups of the population that appear to be most sensitive to the effects of particulate matter include individuals with chronic obstructive pulmonary or cardiovascular disease or influenza, asthmatics, the elderly and children. Particulate matter also soils and damages materials, and is a major cause of visibility impairment in the United States.

Annual and 24-hour National Ambient Air Quality Standards (NAAQS) for particulate matter were first set in 1971. Total suspended particulate (TSP) was the first indicator used to represent suspended particles in the ambient air. Since July 1, 1987, however, EPA has used the indicator PM-10, which

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Sections 107(d)(4)(A) and 181 of the Clean Air Act lists the requirements for designations and classifications of ozone areas.

EPA Revokes the 1-hour Ozone Standard for Most Counties

New 8-Hour Ozone Standard

EPA will not designate areas as nonattainment for the new 8-hour ozone standard until the year 2000. In doing so, EPA will use the 3 years of data most recently available at that time (e.g., 1997-1999).

Title 40, Part 50 of the Code of the Federal Regulations lists the ambient air quality standards for ozone.

CARBON MONOXIDE

Carbon monoxide (CO) is a colorless, odorless and poisonous gas produced by incomplete burning of carbon in fuels. When CO enters the bloodstream, it reduces the delivery of oxygen to the body's organs and tissues. Health threats are most serious for those who suffer from cardiovascular disease, particularly those with angina or peripheral vascular disease. Exposure to elevated CO levels can cause impairment of visual perception, manual dexterity, learning ability and performance of complex tasks.

77% of the nationwide CO emissions are from transportation sources. The largest emissions contribution comes from highway motor vehicles. Thus, the focus of CO monitoring has been on traffic oriented sites in urban areas where the main source of CO is motor vehicle exhaust. Other major CO sources are wood-burning stoves, incinerators and industrial sources.

The National Ambient Air Quality Standard for carbon monoxide is 9 ppm 8-hour nonoverlapping average not to be exceeded more than once per year. The rounding convention in the standard specifies that values of 9.5 ppm, or greater, are counted as exceeding the level of the standard. An area meets the carbon monoxide NAAQS if no more than one 8-hour value per year exceeds the threshold. (High values that occur within 8 hours of the first one are exempted. This is known as using "nonoverlapping averages.") To be in attainment, an area must meet the NAAQS for two consecutive years and carry out air quality monitoring during the entire time. Air quality carbon monoxide value is estimated using EPA guidance for calculating design values (Laxton Memorandum, June 18, 1990).

Title 40, Part 50 of the Code of the Federal Regulations lists the ambient air quality standard for carbon monoxide.

Sections 107(d)(4)(A) and 186 of the Clean Air Act lists the requirements for designations and classifications of carbon monixide areas.

NITROGEN DIOXIDE

Nitrogen dioxide (NO2) is a brownish, highly reactive gas that is present in all urban atmospheres. NO2 can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. Nitrogen oxides are an important precursor both to ozone (O3) and acid rain, and may affect both terrestrial and aquatic ecosystems. The major mechanism for the formation of NO2 in the atmosphere is the oxidation of the primary air pollutant nitric oxide (NO). NOx plays a major role, together with VOCs, in the atmospheric reactions that produce O3. NOx forms when fuel is burned at high temperatures. The two major emissions sources are transportation and stationary fuel combustion sources such as electric utility and industrial conditions, i.e., high temperature and strong solar insolation. The length of the O3 season varies from one area of the country to another. May through October is typical, but states in the south and southwest may monitor the entire year. Northern states have shorter O3 seasons, e.g., May through September for North Dakota. This analysis uses these O3 seasons to ensure that the data completeness requirements apply to the relevant portions of the year.

On November 6, 1991, most areas of the country were designated nonattainment or unclassifiable/attainment. These terms are defined as follows:

Nonattainment
: any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

Attainment
: any area that meets the national primary or secondary ambient air quality standard for the pollutant.

Unclassifiable
: any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

Those areas designated nonattainment were also classified as follows:

Extreme
: Area has a design value of 0.280 ppm and above.

Severe 17
: Area has a design value of 0.190 up to 0.280 ppm and has 17 years to attain.

Severe 15
: Area has a design value of 0.180 up to 0.190 ppm and has 15 years to attain.

Serious
: Area has a design value of 0.160 up to 0.180 ppm.

Moderate
: Area has a design value of 0.138 up to 0.160 ppm.

Marginal
: Area has a design value of 0.121 up to 0.138 ppm.

Submarginal
: Kansas City was the only area classified submarginal, but it has been redesignated attainment. This category includes areas that violate the ozone standard and have a design value of less than 0.121 parts per million. This occurs when there is not a complete set of data so that the estimated design value is higher than the ozone standard exceedance rate of 1.0 per year even though the estimated design value is less than the level of the standard.

Sec. 185A (Previously called Transitional)
: an area desigignated as an ozone nonattainment area as of the date of enactment of the Clean Air Act Amendments of 1990 and has not violated the national primary ambient air quality standard for ozone for the 36-month period commencing on January 1, 1987 and ending on December 31, 1989. Twelve areas were classified transitional in 1991. Section 185A. "Transitional Areas" lists the requirements for these areas.

Incomplete (or No) Data
: an area designated as an ozone nonattainment area as of the date of enactment of the Clean Air Act Amendments of 1990 and did not have sufficient data to determine if it is or is not meeting the ozone standard.

Criteria Pollutants

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EPA uses six "criteria pollutants" as indicators of air quality, and has established for each of them a maximum concentration above which adverse effects on human health may occur. These threshold concentrations are called National Ambient Air Quality Standards (NAAQS).

Areas of the country where air pollution levels persistently exceed the standards may be designated "nonattainment." The following is a discussion of the standards, designations and classifications of these areas.

OZONE

Ozone (O3) is a photochemical oxidant and the major component of smog. While O3 in the upper atmosphere is beneficial to life by shielding the earth from harmful ultraviolet radiation from the sun, high concentrations of O3 at ground level are a major health and environmental concern. O3 is not emitted directly into the air but is formed through complex chemical reactions between precursor emissions of volatile organic compounds (VOC) and oxides of nitrogen (NOx) in the presence of sunlight. These reactions are stimulated by sunlight and temperature so that peak O3 levels occur typically during the warmer times of the year. Both VOCs and NOx are emitted by transportation and industrial sources. VOCs are emitted from sources as diverse as autos, chemical manufacturing, dry cleaners, paint shops and other sources using solvents.

The reactivity of O3 causes health problems because it damages lung tissue, reduces lung function and sensitizes the lungs to other irritants. Scientific evidence indicates that ambient levels of O3 not only affect people with impaired respiratory systems, such as asthmatics, but healthy adults and children as well. Exposure to O3 for several hours at relatively low concentrations has been found to significantly reduce lung function and induce respiratory inflammation in normal, healthy people during exercise. This decrease in lung function generally is accompanied by symptoms including chest pain, coughing, sneezing and pulmonary congestion.

1-Hour Ozone Standard

The ozone threshold value is 0.12 parts per million (ppm), measured as 1-hour average concentration. An area meets the ozone NAAQS if there is no more than one day per year when the highest hourly value exceeds the threshold. (If monitoring did not take place every day because of equipment malfunction or other operational problems, actual measurements are prorated for the missing days. The estimated total number of above-threshold days must be 1.0 or less.) To be in attainment, an area must meet the ozone NAAQS for three consecutive years.

Air quality ozone value is estimated using EPA guidance for calculating design values (Laxton Memorandum, June 18, 1990). Generally, the fourth highest monitored value with 3 complete years of data is selected as the updated air quality value because the standard allows one exceedance for each year. It is important to note that the 1990 Clean Air Act Amendments required that ozone nonattainment areas be classified on the basis of the design value at the time the Amendments were passed, generally the 1987-89 period was used.

The strong seasonality of O3 levels makes it possible for areas to limit their O3 monitoring to a certain portion of the year, termed the O3 season. Peak O3 concentrations typically occur during hot, dry, stagnant summertime

COMISION NACIONAL DEL MEDIO AMBIENTE
DEPTO. DESCONTAMINACION, PLANES Y NORMAS

Reunión Norma de Calidad Primaria para Plomo en Aire
Septiembre 08 de 1999

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13.	DANIEL AGUADÉ	MINISTERIO DE SALUD - PARAGUAY	448 408	585808	—
14.	M.S. LAQUIAS ROMERO	MINISTERIO DE PESQUERÍA - PERÚ	2243231	2243231	—
15.	EDUARDO ESPAÑ	MINISTERIO AMBIENTE - ECUADOR	563-423	565-809	ysaram@mefin.gov.ec
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17.					
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PROCESO DE DICTACION
DE LA NORMA
DE CALIDAD PRIMARIA
PARA PLOMO EN EL AIRE

CONAMA
Depto. Descontaminación,
Planes y Normas
1998-1999

NOVEDADES

Novedades

- Reunión realizada por Grupo de Trabajo "Valor de Norma" (17 de agosto):
  - CONAMA
  - Ministerio de Salud
  - Ministerio de Transporte y Telecomunicaciones
  - Ministerio de Minería
- Definición de procedimientos para determinar el valor de la norma
- Envío de procedimientos a Comité Operativo solicitando observaciones

Novedades

Estudio:

- **Informe Final**
  Preparación de antecedentes técnico-científicos para la elaboración de la norma de calidad primaria de plomo en aire
- Se entregará Resumen Ejecutivo a Comité Operativo
- Se entregará vía e-mail o diskette a interesados

CRONOGRAMAS

proceso de
dictación de norma

PROCESO DE DICTACION DE LA NORMA DE CALIDAD PRIMARIA PARA PLOMO EN EL AIRE

Se prorroga por	189																	
		nov	dic	ene	feb	mar	abr	may	jun	jul	ago	sep	oct	nov	dic	ene	feb	mar
NORMA																		
Resolución de inicio elaboración anteproyecto	17-Dic-98		17															
Formación de expediente público	17-Dic-98		17															
Publicación en Diario Oficial	29-Dic-98		29															
Publicación en La Nación	26-Dic-98		26															
Recepción de antecedentes	6-Mar-99		26			6												
Etapa de estudios científicos y antecedentes	29-Ago-99																	
Aprobación Anteproyecto	30-Nov-99													30				
Publicación en Diario Oficial	1-Dic-99														1			
Publicación en diario circulación nacional	5-Dic-99														5			
Envío expediente a Consejos Consultivos	2-Dic-99														2			
Etapa análisis técnico y económico	24-Ene-00														5	24		
Observaciones públicas y privadas al anteproyecto	30-Ene-00														1	30		
Análisis de observaciones y proyecto definitivo	15-Mar-00															31		15
Aprobación por Consejo Ministros	30-Mar-00																	30

- Entrega de informes de GT (agosto)
- → Reuniones de GT Valor de Norma (agosto)
- Reunión Comité Operativo (30 de agosto)
- → Reuniones GT Valor de Norma
- → Reunión Comité Operativo y Ampliado (13 de septiembre)
  - Presentación Metodologías de Medición
  - → Presentación Procedimiento para determinar valor norma

METODOLOGIA DEFINICION VALOR NORMA

GT "Valor de Norma" definió los siguientes procedimientos para su posterior evaluación:

1. VALOR IGUAL A RECOMENDACION OMS

- Esta opción significa considerar la recomendación de la Organización Mundial de la Salud como norma primaria de calidad para plomo en aire en Chile. Esto se traduce en un valor de norma de 0.5 ug/m3 promedio anual.

VENTAJAS:

- Es el valor recomendado por OMS (estudiado y revisado desde el punto de vista de protección a la salud de las personas).
- Corresponde a la norma de la Comunidad Europea, Suiza y otros países.
- En Chile se cumple con la condición requerida de que el 98% de la población presenta niveles bajo 10 ug/dl de Pb en sangre.
- Es económicamente factible de implementar en Chile.
- Cualquier costo asociado al cumplimiento de esta norma es asociable a un beneficio demostrado.

2. VALOR MAXIMO EXISTENTE PERO INFERIOR A OMS

- Esta opción significa revisar los antecedentes existentes de calidad ambiental para plomo en aire a lo largo del país y sobre esa base definir un valor de norma, que corresponda al valor máximo existente (disponible) en el país, pero que no sea superior a 0.5 ug/m3 (valor OMS).

VENTAJAS

- Las mismas anteriores, excepto el punto e)
- Permite revisar la situación actual y abre la posibilidad de considerar la calidad actual del país.
- Puede llevar a una "sobreprotección" de la población (valor más exigente que recomendación OMS)

DESVENTAJAS:

- Significa costos mayores en comparación a la Opción I, sin beneficios demostrados*
- No se cuenta con toda la información de calidad de aire existente

*: Entenderemos por "beneficios demostrados" aquellos que considera la OMS para definir su valor de referencia. Sin embargo, también debemos saber que algunos organismos, incluyendo la OMS, indican que por el momento no existe evidencia de un umbral seguro de niveles de plomo en sangre, bajo el cual no haya efectos del plomo en la salud de las personas.

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MEDICION DEL PLOMO

- Los antecedentes disponibles de la OMS no entregan una especificación de si el plomo se considera en PM10 o PTS. Dado eso, asumimos que se refiere a material particulado total (PTS) en el cual una concentración de plomo superior a 0.5 ug/m3 presentaría efectos observados en la salud de las personas. No obstante, estamos tratando de obtener mayor información al respecto.
- La Comunidad Europea, a su vez, establece que el método de referencia para el muestreo del plomo será el del PM10.
- Se supone que en áreas urbanas, la mayoría de las partículas de plomo tienen un diámetro aerodinámico en un rango entre 0.25 a 1.4 um,, por lo que un muestreador de PM10 representaría razonablemente bien las estimaciones de plomo en aire.

- En nuestro país debemos analizar si los antecedentes disponibles confirman este supuesto, por cuanto se requiere hacer un análisis de los antecedentes y luego definir si el cumplimiento de la norma debería ser medida en PM10, o bien, si se requiere "traducir" el valor de la OMS (medido en PTS) a un valor más estricto medido en el PM10.
- Esto último, considerando que la infraestructura existente de medición de material particulado a lo largo del país está principalmente orientada a PM10.
- En áreas cercanas a determinadas fuentes fijas, por ejemplo acopios, pueden presentar partículas de plomo de diámetro superior a 10 ug, por cuanto su medición con instrumentos asociados a PM10 subestimaría la concentración real. Para esos casos específicos se plantea la alternativa de aplicar la norma de OMS (0.5 ug(m3) medida en PTS.

VALOR DE EMERGENCIA U OTRO NORMA ADICIONAL

- Comunidad Europea: En el caso del Pb los efectos sobre la salud de las concentraciones de plomo en aire se asocian únicamente a exposiciones a largo plazo, por lo cual no fija un umbral de alerta para este contaminante.
- Estudio GREDIS: Proponen como norma adicional al valor promedio anual (0.5 ug/m3) una norma promedio trimestral de 1 ug/m3 para evitar exposiciones agudas.

PROXIMOS PASOS

- Entrega de informes de GT (septiembre)
- Reuniones de GT "Valor de Norma" (septiembre-octubre)
  - a) Analizar implicancia de medición de plomo en PM10 /PTS
  - b) Evaluar la aplicación de procedimiento 1
  - c) Aplicar procedimiento 2 y evaluar su aplicación
  - d) Valores de emergencia o valor de norma adicional
- Reunión GT "Evaluación Económica" (septiembre)
- Reunión Comité Operativo y Ampliado (18 octubre)
  - Presentación de resultados de GT "Valor de Norma"
  - Presentación avance de GT "Evaluación Económica"
  - Presentación de resultados GT "Metodología de Medición"

COMISION NACIONAL DEL MEDIO AMBIENTE(CONAMA)
UNIDAD DE DESCONTAMINACION, PLANES Y NORMAS

Con fecha 10 de septiembre de 1999 se archivaron bajo los números que a continuación se indica el siguiente antecedente para la elaboración de la norma de calidad primaria para plomo en el aire:

10-NOR-3/98: Informe Final estudio "Preparación de antecedentes técnico-científicos para la elaboración de la Norma de Calidad Primaria para Plomo en Aire", realizado por GREDIS.

11-NOR-3/98: Informe situacional "Eliminación del Plomo en la Gasolina en América Latina y el Caribe", realizado por ESMAP.

12-NOR-3/98: Informe de la Conferencia y el Taller "Prevención del Envenenamiento por Plomo en las Américas: la salud, el Medio Ambiente y el Desarrollo Sostenible.

13-NOR-3/98: locating and estimating air emissions from sources of lead and lead compounds, realizado por EPA.

Patricia Matus C.
Jefe Depto. Descontaminación,
Planes y Normas

Norma de Calidad Primaria de Plomo en Aire

ACTA DE REUNION DE COMITÉ OPERATIVO Y COMITÉ AMPLIADO

FECHA REUNION : 8 de Septiembre de 1999
LUGAR : CONAMA -Santiago
HORARIO :.15:00 – 16:30 hrs.

ASISTENCIA :

Richard Vargas V.	S. Salud Concepción
Anibal Mege	SOFOFA
Manuel Cortés	S. Salud Antofagasta
Andrei N. Tchernitchin	Colegio Médico de Chile
Carlos Salvo	SONAMI
Eduardo Giesen	ENAMI
Fernando Cacho	Intendencia R.M.
Yamal Soto M.	CNE
Alejandro Ibarra	CONAMA II Región
Walter Folch	MINSAL
Bartolomé Alfaro	CODELCO, Div. El Teniente
Germán Oyola	CONAMA VIII Región
Maritza Jadrijevic	CONAMA
Andrea Urrutia	Memorista Universidad de Chile
Guiselle Romero	Min. Transportes y Comunicaciones, Perú
Daniel Aguadé	Min. de Salud, Ecuador
Malaquías Romero	Min. de Pesca, Perú
Eduardo Espan	Min del Ambiente, Ecuador

Tabla :

1. Informe de novedades del proceso de elaboración de la norma
2. Presentación del procedimiento para fijar el valor de la Norma

Desarrollo:

1. La Sra. Andrea Muñoz presenta las novedades del proceso:

- Da cuenta de las actividades realizadas con el fin de establecer un procedimiento para fijar el valor de la norma:
  - Reunión el 17 de Agosto del G.T "Valor de Norma", formado por MINSAL, MINTRATEL,MINMIN y CONAMA, para definir el procedimiento para fijar el valor de la norma.
  - Envío de la propuesta formulada por el G.T al Comité Operativo para Observaciones.
- Informa que el estudio " Generación de Antecedentes Técnicos y Científicos para la elaboración de una norma de calidad primaria de plomo en aire", realizado por la empresa consultora GREDIS está listo y a disposición del Comité Ampliado.
- Presenta el cronograma del proceso e indica que el 30 de Noviembre debe estar listo el anteproyecto.
- Informa respecto a los avances de los distintos grupos de trabajo.

Presentación de la propuesta del grupo de trabajo " Valor de Norma"

Se presentan dos alternativas, con sus ventajas y desventajas:

a) Establecer el valor recomendado por la OMS
b) Establecer un valor menor al fijado por la OMS, pero no menor que el máximo valor de concentración detectado en el país.

Observaciones y preguntas:

- **S. S. de Concepción** indica que la alternativa b) presenta la ventaja adicional de ser preventiva y que entregaría a Chile liderazgo en relación a la OMS.

- **Colegio Medico** señala que no hay un umbral claro bajo el cual el plomo no tenga efectos, por lo cual es más fácil mantener un valor bajo (que ya existe), que después reducirlo si se viera la necesidad de hacerlo por evidencias de daños a la salud.

- **SOFOFA** indica que con esa filosofía habría que poner un valor cero, y que la OMS tienen fundamentos sólidos para fijar el valor recomendado.

- **Colegio Médico** afirma que si se pone un valor más alto que los que se registran en el país se estará invitando a empresas más sucias a emitir plomo.

- **CONAMA** dice que se considera como valor máximo posible, 0.5 ug/m^3, y que las dos alternativas presentadas serán evaluadas desde el punto de vista técnico y económico.

- **S.S. de Concepción** dice que la OMS fija un valor para PTS y que haciendo la equivalencia con el PM10 este valor debería ser un poco menor.

- Se discute donde medir el plomo; se afirma que lo más seguro sería medir en el PTS, pero dado que la infraestructura existente es para medir PM10 y que se ha demostrado que el Plomo se encuentra en un rango de tamaño cercano a 1 micrón, lo lógico sería medir en el PM10.

- **Colegio Médico** indica que en el norte y en el caso de partículas resuspendidas el plomo se puede encontrar en las partículas mayores a 10 micrones.

- **CONAMA** propone medir plomo en PTS en casos puntuales, tales como en aquellos lugares donde hay acopios.

- Se discute sobre el sentido de establecer valores de emergencia. **SONAMI** indica que desde que se recolecta el material particulado, se hacen los análisis y se obtienen los resultados, pasan al menos veinte días, por lo cual no sería pertinente establecer un valor de emergencia. **S. S de Concepción** indica que un valor trimestral considera la exposición de carácter agudo, ya que permite conocer los valores estacionales, y hay mucha diferencia entre una estación del año y otra.

- **ENAMI** pregunta si el promedio trimestral sería móvil o no. **SOFOFA** dice que debiera serlo. El representante de Ecuador, de visita en esta reunión, indica que en Ecuador el promedio es móvil.

- **CONAMA** señala que todo esto se va a discutir y definir en el G.T " Metodología de Medición".

- **Colegio Médico** dice que va a dar a conocer un estudio que demuestra que 1 mes o dos de exposición al plomo puede incidir en el desarrollo de los niños.

- S. **S de Concepción** afirma que se inclina por establecer el valor recomendado por la OMS y que le gustaría escuchar la opinión de los otras organismos participantes.

Andrea Muñoz
Depto. Descontaminación, Planes y Normas

GOTUZZO 1995

F=fino; C=grueso

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Hora Inicio	Hora Termino	Dia Inicio	ng/m3 PbF	ng/m3 PbC
8:30:00	16:30:00	1-Jul-95	602.30	295.01
22:00:00	6:00:00	1-Jul-95	555.55	291.45
8:30:00	16:30:00	2-Jul-95	391.14	158.64
22:00:00	6:00:00	2-Jul-95	758.33	652.30
8:30:00	16:30:00	3-Jul-95	593.98	1480.48
22:00:00	6:00:00	3-Jul-95	411.33	1581.20
8:30:00	16:30:00	4-Jul-95	372.01	2988.47
22:00:00	6:00:00	4-Jul-95	111.96	29.58
8:30:00	16:30:00	5-Jul-95	443.18	187.01
22:00:00	6:00:00	5-Jul-95	770.93	339.54
8:30:00	16:30:00	6-Jul-95	760.26	461.23
22:00:00	6:00:00	6-Jul-95	1052.74	857.42
8:30:00	16:30:00	7-Jul-95	554.34	500.45
22:00:00	6:00:00	7-Jul-95	681.66	1998.79
8:30:00	16:30:00	8-Jul-95	432.68	372.45
22:00:00	6:00:00	8-Jul-95	390.95	176.65
8:30:00	16:30:00	9-Jul-95	652.85	357.55
22:00:00	6:00:00	9-Jul-95	727.32	573.19
8:30:00	16:30:00	10-Jul-95	462.70	844.47
22:00:00	6:00:00	10-Jul-95	600.75	1871.53
8:30:00	16:30:00	11-Jul-95	365.07	549.19
22:00:00	6:00:00	11-Jul-95	722.05	550.33
8:30:00	16:30:00	12-Jul-95	400.85	193.76
:00:00	6:00:00	12-Jul-95	310.04	115.09
8:30:00	16:30:00	13-Jul-95	531.37	380.67
22:00:00	6:00:00	13-Jul-95	309.69	309.39
8:30:00	16:30:00	14-Jul-95	466.29	292.58
22:00:00	6:00:00	14-Jul-95	157.90	53.15
8:30:00	16:30:00	15-Jul-95	260.45	167.52
22:00:00	6:00:00	15-Jul-95	417.43	339.19
8:30:00	16:30:00	16-Jul-95	444.52	295.22
22:00:00	6:00:00	16-Jul-95	533.52	1156.65
8:30:00	16:30:00	17-Jul-95	383.30	539.17
22:00:00	6:00:00	17-Jul-95	315.82	499.17
8:30:00	16:30:00	18-Jul-95	311.62	563.65
22:00:00	6:00:00	18-Jul-95	226.71	257.60
8:30:00	16:30:00	19-Jul-95	378.31	777.52
22:00:00	6:00:00	19-Jul-95	201.19	631.52
8:30:00	16:30:00	20-Jul-95	301.57	526.04
22:00:00	6:00:00	20-Jul-95	203.48	1120.65
8:30:00	16:30:00	21-Jul-95	153.79	894.47
:00:00	6:00:00	21-Jul-95	289.32	1123.51
8:30:00	16:30:00	22-Jul-95	318.50	1127.76
22:00:00	6:00:00	22-Jul-95	399.25	184.22
8:30:00	16:30:00	23-Jul-95	123.73	50.36
22:00:00	6:00:00	23-Jul-95	106.93	41.00
8:30:00	16:30:00	24-Jul-95	267.85	324.08
22:00:00	6:00:00	24-Jul-95	312.95	714.00
8:30:00	16:30:00	25-Jul-95	290.20	323.57
22:00:00	6:00:00	25-Jul-95	156.68	76.38
8:30:00	16:30:00	26-Jul-95	315.88	164.43
22:00:00	6:00:00	26-Jul-95	301.70	130.78
8:30:00	16:30:00	27-Jul-95	317.34	171.09
22:00:00	6:00:00	27-Jul-95	238.38	105.93
8:30:00	16:30:00	28-Jul-95	212.74	170.44
22:00:00	6:00:00	28-Jul-95	335.82	165.28
8:30:00	16:30:00	29-Jul-95	150.99	73.33
22:00:00	6:00:00	29-Jul-95	357.64	173.53

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22:00:00	6:00:00	30-Jul-95	450.10	451.73
8:30:00	16:30:00	31-Jul-95	357.35	182.11
22:00:00	6:00:00	31-Jul-95	193.54	92.57
8:30:00	16:30:00	1-Ago-95	221.03	135.05
22:00:00	6:00:00	1-Ago-95	225.39	124.71
8:30:00	16:30:00	2-Ago-95	280.25	152.87
22:00:00	6:00:00	2-Ago-95	294.47	128.39
8:30:00	16:30:00	3-Ago-95	239.65	105.19
22:00:00	6:00:00	3-Ago-95	371.70	481.36
8:30:00	16:30:00	4-Ago-95	238.49	294.06
22:00:00	6:00:00	4-Ago-95	395.14	199.55
8:30:00	16:30:00	5-Ago-95	405.29	427.00
22:00:00	6:00:00	5-Ago-95	369.58	381.71
8:30:00	16:30:00	6-Ago-95	661.80	494.74
22:00:00	6:00:00	6-Ago-95	396.88	123.97
8:30:00	16:30:00	7-Ago-95	393.24	269.70
22:00:00	6:00:00	7-Ago-95	242.26	540.93
8:30:00	16:30:00	8-Ago-95	300.28	641.41
22:00:00	6:00:00	8-Ago-95	272.73	495.08
8:30:00	16:30:00	9-Ago-95	93.67	62.34
22:00:00	6:00:00	9-Ago-95	243.39	145.62
8:30:00	16:30:00	10-Ago-95	336.72	197.60
22:00:00	6:00:00	10-Ago-95	415.89	246.67
8:30:00	16:30:00	11-Ago-95	323.03	448.41
22:00:00	6:00:00	11-Ago-95	208.09	107.96
8:30:00	16:30:00	12-Ago-95	223.42	104.67
22:00:00	6:00:00	12-Ago-95	396.67	454.46
8:30:00	16:30:00	13-Ago-95	254.19	527.37
[illegible]0:00	6:00:00	13-Ago-95	234.30	118.54
8:30:00	16:30:00	14-Ago-95	65.07	28.60
22:00:00	6:00:00	14-Ago-95	55.01	11.91
8:30:00	16:30:00	15-Ago-95	123.97	48.65
22:00:00	6:00:00	15-Ago-95	257.79	151.67
8:30:00	16:30:00	16-Ago-95	158.45	74.83
22:00:00	6:00:00	16-Ago-95	251.86	264.94
8:30:00	16:30:00	17-Ago-95	223.45	283.50
22:00:00	6:00:00	17-Ago-95	240.74	175.43
8:30:00	16:30:00	18-Ago-95	196.93	306.03
22:00:00	6:00:00	18-Ago-95	263.38	413.37
8:30:00	16:30:00	19-Ago-95	318.89	693.76
22:00:00	6:00:00	19-Ago-95	349.33	184.32
8:30:00	16:30:00	20-Ago-95	262.91	844.42
22:00:00	6:00:00	20-Ago-95	173.98	368.88
8:30:00	16:30:00	21-Ago-95	334.12	850.65
22:00:00	6:00:00	21-Ago-95	131.63	77.42
8:30:00	16:30:00	22-Ago-95	181.78	124.62
[illegible]0:00	6:00:00	22-Ago-95	244.61	187.29
8:30:00	16:30:00	23-Ago-95	289.54	157.74
8:30:00	16:30:00	24-Ago-95	553.23	394.01
22:00:00	6:00:00	24-Ago-95	137.69	34.01
8:30:00	16:30:00	25-Ago-95	183.97	109.11
22:00:00	6:00:00	25-Ago-95	546.04	786.30
8:30:00	16:30:00	26-Ago-95	721.72	1460.81
22:00:00	6:00:00	26-Ago-95	529.38	342.65
8:30:00	16:30:00	27-Ago-95	915.62	859.89
22:00:00	6:00:00	27-Ago-95	224.70	124.47
8:30:00	16:30:00	28-Ago-95	163.52	79.43
22:00:00	6:00:00	28-Ago-95	155.27	80.48
8:30:00	16:30:00	29-Ago-95	451.86	224.05
22:00:00	6:00:00	29-Ago-95	494.06	580.01
8:30:00	16:30:00	30-Ago-95	590.16	342.61
22:00:00	6:00:00	30-Ago-95	446.89	330.32
8:30:00	16:30:00	31-Ago-95	337.19	310.94

1998

NOTA: :Parque O´Higgins, Pudahuel y Las Condes se midió cada 12 horas

000847

1998

Label	Dia inic	hora inic	Dia final	Hora final	PARQUE O'HIGGINS ng/m3 PbF	ng/m3 PbC
OHI - 01	15-Jul	10:02	15-Jul	17:34	304.335	207.176
OHI - 02	21-Jul	9:48	21-Jul	21:14	124.848	71.647
OHI - 03	21-Jul	21:21	22-Jul	10:21	635.851	276.375
OHI - 04	22-Jul	10:25	22-Jul	20:08	152.389	59.088
OHI - 05	22-Jul	20:14	23-Jul	9:23	103.051	38.283
OHI - 06	23-Jul	9:23	23-Jul	20:30	115.087	49.862
OHI - 07	23-Jul	20:34	24-Jul	9:38	477.084	383.963
OHI - 08	24-Jul	9:44	24-Jul	21:37	117.291	52.422
OHI - 09	24-Jul	21:43	25-Jul	9:00	287.113	420.860
OHI - 10	25-Jul	9:00	25-Jul	19:13	203.120	364.961
OHI - 11	25-Jul	19:19	26-Jul	8:40	219.800	667.696
OHI - 12	26-Jul	8:40	27-Jul	10:54	341.469	511.117
OHI - 14	27-Jul	10:59	27-Jul	19:12	257.272	182.367
OHI - 13	27-Jul	19:17	28-Jul	11:25	217.181	450.060
OHI - 15	28-Jul	11:40	28-Jul	21:15	130.563	281.324
OHI - 16	28-Jul	21:21	29-Jul	11:10	184.155	527.757
OHI - 17	29-Jul	11:20	29-Jul	21:23	104.028	199.175
OHI - 18	29-Jul	21:30	30-Jul	10:15	98.748	42.787
OHI - 19	30-Jul	10:18	30-Jul	20:46	57.270	20.085
OHI - 20	30-Jul	20:50	31-Jul	9:50	405.060	237.001
OHI - 21	31-Jul	9:58	31-Jul	22:24	190.127	216.074
OHI - 22	31-Jul	22:28	1-Ago	12:22	318.107	499.270
OHI - 23	1-Ago	12:30	1-Ago	19:07	148.723	160.923
OHI - 24	1-Ago	19:13	2-Ago	8:10	235.570	637.427
OHI - 25	2-Ago	8:12	2-Ago	21:32	226.059	209.981
OHI - 26	2-Ago	21:37	3-Ago	10:04	89.357	57.795
OHI - 27	3-Ago	10:17	3-Ago	19:08	35.572	25.316
OHI - 28	3-Ago	19:12	4-Ago	11:43	458.445	447.499
OHI - 29	4-Ago	11:50	4-Ago	21:26	83.275	79.362
OHI - 30	4-Ago	21:30	5-Ago	10:43	154.336	448.886
OHI - 31	5-Ago	10:50	5-Ago	20:12	95.780	104.604
OHI - 32	5-Ago	20:16	6-Ago	9:45	114.253	445.965
OHI - 33	6-Ago	9:45	6-Ago	19:10	137.514	123.062
OHI - 34	6-Ago	19:14	7-Ago	11:09	107.674	49.759
OHI - 35	7-Ago	11:20	7-Ago	22:01	28.972	16.313
OHI - 36	7-Ago	22:06	8-Ago	8:45	380.121	159.829
OHI - 37	8-Ago	8:50	8-Ago	20:07	85.382	38.130
OHI - 38	8-Ago	20:11	9-Ago	8:50	231.430	113.546
OHI - 39	9-Ago	8:56	9-Ago	19:07	73.130	26.186
OHI - 40	9-Ago	19:10	10-Ago	12:21	174.523	247.391
OHI - 41	10-Ago	12:27	10-Ago	19:38	24.483	10.149
OHI - 42	10-Ago	19:42	11-Ago	9:37	307.766	297.083
OHI - 43	11-Ago	9:44	11-Ago	21:45	63.636	94.302
OHI - 44	11-Ago	21:50	12-Ago	9:14	123.952	356.499
OHI - 45	12-Ago	9:19	12-Ago	21:09	100.946	57.151
OHI - 46	12-Ago	21:12	13-Ago	10:02	256.894	278.553
OHI - 47	13-Ago	10:08	13-Ago	19:18	94.580	64.001
OHI - 48	13-Ago	19:21	14-Ago	12:07	72.018	774.437
OHI - 49	14-Ago	12:10	14-Ago	22:39	40.529	37.131
OHI - 50	14-Ago	22:43	15-Ago	8:21	113.453	50.198
OHI - 51	15-Ago	8:24	15-Ago	19:47	152.959	339.315
OHI - 52	15-Ago	19:50	16-Ago	8:35	166.043	560.491
OHI - 53	16-Ago	8:39	16-Ago	22:03	231.755	177.270
OHI - 54	16-Ago	22:06	17-Ago	9:19	196.500	198.437
OHI - 55	17-Ago	9:24	17-Ago	19:13	76.963	37.324
OHI - 56	17-Ago	19:17	18-Ago	9:39	241.885	136.052
OHI - 57	18-Ago	9:44	18-Ago	21:51	81.825	35.540
OHI - 58	18-Ago	21:55	19-Ago	9:37	156.565	219.812
OHI - 59	19-Ago	9:42	19-Ago	19:11	47.787	20.801
OHI - 60	19-Ago	19:15	20-Ago	12:00	150.162	253.948

000848

Label	Dia inic	hora inic	Dia final	Hora final	LAS CONDES ng/m3 PbF	ng/m3 PbC
	1998					
LCD-0	20-Jul	12:37	21-Jul	13:06	76.446	31.240
LCD-0	21-Jul	13:15	21-Jul	22:01	69.547	36.748
LCD-0	21-Jul	22:10	22-Jul	10:35	57.141	31.670
LCD-0	22-Jul	10:41	22-Jul	20:54	88.535	66.090
LCD-0	22-Jul	21:00	23-Jul	10:45	90.482	36.703
LCD-0	23-Jul	11:00	23-Jul	21:19	94.703	48.725
LCD-0	23-Jul	21:24	24-Jul	9:16	65.608	29.005
LCD-0	24-Jul	9:20	24-Jul	22:16	77.174	28.993
LCD-0	24-Jul	22:21	25-Jul	10:40	50.479	17.535
LCD-1	25-Jul	10:40	25-Jul	20:47	60.000	75.000
LC)-1	25-Jul	20:52	26-Jul	10:20	50.948	42.145
LC -1	26-Jul	10:20	26-Jul	18:50	105.668	67.348
LC -1	26-Jul	18:55	27-Jul	10:35	176.071	85.750
LCD-	27-Jul	10:40	27-Jul	20:22	144.158	72.464
LCD-	27-Jul	20:26	28-Jul	10:38	99.389	51.465
LCD-6	28-Jul	10:45	28-Jul	19:41	72.893	189.282
LCD-7	28-Jul	19:46	29-Jul	10:35	89.139	29.946
LCD18	29-Jul	10:43	29-Jul	19:52	55.206	103.024
LCD19	29-Jul	19:57	30-Jul	10:16	79.580	49.132
LCD20	30-Jul	10:20	30-Jul	19:07	247.847	64.591
LCD21	30-Jul	19:10	31-Jul	10:38	113.230	54.946
LCD22	31-Jul	10:45	31-Jul	20:47	100.519	146.945
LCD-23	31-Jul	20:50	1-Ago	10:20	99.222	28.589
LCD-24	1-Ago	10:25	1-Ago	20:47	70.962	110.494
LCD-25	1-Ago	20:51	2-Ago	10:21	109.359	39.313
LCD-26	2-Ago	10:25	2-Ago	20:04	65.839	69.465
LCD-27	2-Ago	20:08	3-Ago	10:39	85.845	27.019
LCD-28	3-Ago	10:55	3-Ago	20:54	99.620	29.899
LCD-29	3-Ago	20:59	4-Ago	10:32	43.645	20.998
LCD-30	4-Ago	10:40	4-Ago	19:49	68.013	71.505
LCD-31	4-Ago	19:54	5-Ago	10:35	80.402	34.925
LCD-32	5-Ago	10:35	5-Ago	21:23		
LCD-33	5-Ago	21:29	6-Ago	10:45	68.857	28.335
LCD-34	6-Ago	10:52	6-Ago	20:59	99.146	42.690
LCD-35	6-Ago	21:03	7-Ago	9:10	74.640	42.245
LCD-36	7-Ago	9:15	7-Ago	20:05	72.195	30.603
LCD-37	7-Ago	20:09	8-Ago	10:40	44.466	24.395
LCD-38	8-Ago	10:46	8-Ago	21:35	81.370	20.192
LCD-39	8-Ago	21:39	9-Ago	10:33	65.402	27.255
LCD-40	9-Ago	10:40	9-Ago	20:31	59.718	7.750
LCD-41	9-Ago	20:34	10-Ago	10:45	53.362	18.815
LCD-42	10-Ago	10:48	10-Ago	21:19	54.281	23.040
LCD-43	10-Ago	21:24	11-Ago	10:40	38.789	15.851
LCD-44	11-Ago	10:43	11-Ago	20:08	63.604	21.562
LCD-45	11-Ago	20:11	12-Ago	10:20	44.052	26.403
LCD-46	12-Ago	10:43	12-Ago	20:07	83.048	37.939
LCD-47	12-Ago	20:11	13-Ago	10:40	68.831	23.786
LCD-48	13-Ago	10:47	13-Ago	21:04	64.358	56.374
LCD-49	13-Ago	21:08	14-Ago	10:22	57.322	18.610
LCD-50	14-Ago	10:27	14-Ago	20:50	48.443	108.081
LCD-51	14-Ago	20:54	15-Ago	10:40	79.231	40.347
LCD-52	15-Ago	10:44	15-Ago	21:08	115.111	121.300
LCD-53	15-Ago	21:12	16-Ago	10:20	115.690	45.088
LCD-54	16-Ago	10:23	16-Ago	21:24	137.629	31.567
LCD-55	16-Ago	21:24	17-Ago	10:43	37.730	12.023
LCD-56	17-Ago	10:48	17-Ago	20:55	64.206	25.918
LCD-57	17-Ago	20:59	18-Ago	10:14	52.966	17.735
LCD-58	18-Ago	10:18	18-Ago	21:04	102.329	41.414
LCD-59	18-Ago	21:07	19-Ago	10:38	96.162	35.632
LCD-60	19-Ago	10:46	19-Ago	20:23	77.218	21.454

1998

Label	Dia inic	inic	Dia final	Hora final	PUDAHUEL ng/m3 PbF	ng/m3 PbC
PAD - 01	15-Jul	19:48	16-Jul	15:25	178.496	162.565
PAD - 02	16-Jul	16:04	17-Jul	11:10	80.600	41.833
PAD - 03	17-Jul	11:28	18-Jul	13:32	66.703	22.112
PAD - 04	18-Jul	13:53	19-Jul	14:05	61.403	377.032
PAD - 05	19-Jul	14:15	20-Jul	19:26	88.883	99.974
PAD - 06	20-Jul	19:32	21-Jul	11:36	102.809	49.535
PAD - 07	21-Jul	11:59	21-Jul	20:26	74.132	27.507
PAD - 08	21-Jul	20:31	22-Jul	19:19	173.320	83.187
PAD - 09	22-Jul	19:25	23-Jul	9:54	48.940	27.768
PAD - 10	23-Jul	10:21	23-Jul	19:47	93.476	37.820
PAD - 11	23-Jul	19:51	24-Jul	10:10	150.696	157.844
PAD - 12	24-Jul	10:18	24-Jul	20:43	99.399	30.020
PAD - 13	24-Jul	20:49	25-Jul	10:33	201.620	236.735
PAD - 14	25-Jul	10:39	25-Jul	19:50	81.735	80.116
PAD - 15	25-Jul	19:55	26-Jul	10:28	280.454	584.223
PAD - 16	26-Jul	10:35	26-Jul	19:51	142.500	60.531
PAD - 17	26-Jul	19:57	27-Jul	6:42	203.471	393.951
PAD - 18	27-Jul	6:48	27-Jul	19:09	243.726	251.953
PAD - 19	27-Jul	19:16	28-Jul	5:49	224.213	347.686
PAD - 20	28-Jul	5:53	28-Jul	20:40	185.000	247.162
PAD - 21	28-Jul	20:46	29-Jul	10:17	93.347	631.922
PAD - 22	29-Jul	10:27	29-Jul	20:48	40.731	67.567
PAD - 23	29-Jul	20:53	30-Jul	9:55	45.087	29.004
PAD - 24	30-Jul	10:00	30-Jul	20:09	34.336	19.497
PAD - 25	30-Jul	20:13	31-Jul	9:56	142.062	70.470
PAD - 26	31-Jul	10:01	31-Jul	21:46	108.693	46.817
PAD - 27	31-Jul	21:52	1-Ago	10:01	215.758	312.281
PAD - 28	1-Ago	10:07	1-Ago	19:44	100.069	117.386
PAD - 29	1-Ago	19:48	2-Ago	10:27	197.387	273.504
PAD - 30	2-Ago	10:33	2-Ago	20:56	76.495	71.031
PAD - 31	2-Ago	21:00	3-Ago	9:56	42.371	21.954
PAD - 32	3-Ago	10:02	3-Ago	19:52	44.479	28.726
PAD - 33	3-Ago	19:56	4-Ago	9:53	136.905	143.130
PAD - 34	4-Ago	9:58	4-Ago	20:48	42.955	71.562
PAD - 35	4-Ago	20:53	5-Ago	9:48	75.602	271.145
PAD - 36	5-Ago	9:53	6-Ago	10:00	43.229	100.202
PAD - 37	6-Ago	10:05	6-Ago	19:51	62.390	43.353
PAD - 38	6-Ago	19:56	7-Ago	9:39	64.179	29.946
PAD - 39	7-Ago	9:48	7-Ago	21:15	29.706	16.173
PAD - 40	7-Ago	21:20	8-Ago	9:50	89.404	79.913
PAD - 41	8-Ago	9:54	8-Ago	20:41	75.037	41.988
PAD - 42	8-Ago	20:45	9-Ago	10:49	92.776	48.305
PAD - 43	9-Ago	10:54	9-Ago	19:44	33.030	22.531
PAD - 44	9-Ago	19:49	10-Ago	9:24	65.979	56.299
PAD - 45	10-Ago	9:29	10-Ago	20:26	29.525	16.378
PAD - 46	10-Ago	20:30	11-Ago	9:32	72.966	90.169
PAD - 47	11-Ago	9:36	11-Ago	21:04	47.423	79.737
PAD - 48	11-Ago	21:07	12-Ago	9:49	99.365	298.157
PAD - 49	12-Ago	9:53	12-Ago	19:08	46.708	27.454
PAD - 50	12-Ago	19:13	13-Ago	9:56	107.313	267.127
PAD - 51	13-Ago	9:59	13-Ago	19:54	37.818	37.295
PAD - 52	13-Ago	19:58	14-Ago	9:41	49.272	273.447
PAD - 53	14-Ago	9:45	14-Ago	21:50	38.758	52.974
PAD - 54	14-Ago	21:54	15-Ago	10:45	76.407	57.725
PAD - 55		10:50	15-Ago	20:20	72.072	108.687
PAD - 56	15-Ag	20:24	16-Ago	10:48	289.014	57.030
PAD - 57	16-Ag	10:51	16-Ago	20:41	86.078	42.968
PAD - 58	16-Ag	20:44	17-Ago	9:40	69.897	72.066
PAD - 59	17-Ago	9:44	17-Ago	19:51	63.456	26.599
PAD - 60	17-Ag	19:55	18-Ago	10:03	76.024	69.995

000850

1998

PELDEHUE

Label	Dia inic	hora inic	Dia final	Hora final	ng/m3 **PbF**	ng/m3 **PbC**
PEL-01	23-Jul	15:25	24-Jul	13:15	91.989	33.062
PEL-02	24-Jul	13:20	25-Jul	15:11	62.377	16.403
PEL-03	25-Jul	15:30	26-Jul	15:10	71.125	13.454
PEL-04	26-Jul	15:13	27-Jul	14:25	92.026	32.451
PEL-05	27-Jul	14:30	28-Jul	13:10	65.645	21.011
PEL-06	28-Jul	13:15	29-Jul	12:20	37.731	18.791
PEL-07	29-Jul	12:25	30-Jul	13:45	59.948	63.004
PEL-08	30-Jul	13:57	31-Jul	11:50	78.491	37.569
PEL-09	31-Jul	11:53	1-Ago	12:05	87.167	37.452
PEL-10	1-Ago	12:40	2-Ago	14:15	53.181	19.531
PEL-11	2-Ago	14:20	3-Ago	11:07	49.544	16.397
PEL-12	3-Ago	12:10	4-Ago	14:45	46.172	19.440
PEL-13	4-Ago	15:04	5-Ago	14:40	54.136	19.555
PEL-14	5-Ago	14:45	6-Ago	12:10	39.966	34.324
PEL-15	6-Ago	12:15	7-Ago	12:00	59.328	23.895
PEL-16	7-Ago	12:07	8-Ago	14:10	95.284	31.276
PEL-17	8-Ago	14:20	9-Ago	14:35	15.879	5.332
PEL-18	9-Ago	14:45	10-Ago	12:15	24.002	8.006
PEL-19	10-Ago	12:18	11-Ago	12:50	16.312	5.968
PEL-20	11-Ago	12:58	12-Ago	12:40	23.733	8.473
PEL-21	12-Ago	12:45	13-Ago	12:45	52.417	16.009
PEL-22	13-Ago	12:48	14-Ago	14:20	20.041	25.326
PEL-23	14-Ago	14:28	15-Ago	15:00	20.194	27.266
PEL-24	15-Ago	15:08	16-Ago	14:45	51.531	18.118
PEL-25	16-Ago	14:48	17-Ago	14:30	24.298	5.877
PEL-26	17-Ago	14:35	18-Ago	10:50	112.104	18.003
PEL-27	18-Ago	10:53	19-Ago	10:00	92.813	49.124
PEL-28	19-Ago	10:02	20-Ago	13:00	87.419	15.595
PEL-29	20-Ago	13:05	21-Ago	11:10	57.571	10.849
PEL-30	21-Ago	11:18	22-Ago	14:10	29.915	26.887

1998

TALAGANTE

Label	Dia inic	hora inic	Dia final	Hora final	ng/m3 **PbF**	ng/m3 **PbC**
TGT-01	17-Jul	17:25	18-Jul	17:25	59.589	14.125
TGT-02	18-Jul	17:30	19-Jul	16:50	75.742	25.330
TGT-03	19-Jul	17:00	20-Jul	9:50	44.467	18.264
TGT-04	20-Jul	11:30	21-Jul	11:30	73.890	27.933
TGT-05	21-Jul	11:30	22-Jul	11:00	51.763	10.385
TGT-06	23-Jul	11:00	24-Jul	11:15	29.716	11.520
TGT-07	24-Jul	11:25	25-Jul	11:25		14.023
TGT-08	25-Jul	12:00	26-Jul	12:45	83.297	21.148
TGT-09	26-Jul	13:00	27-Jul	10:00		
TGT-10	27-Jul	10:00	28-Jul	9:42	45.061	21.632
TGT-11	28-Jul	9:50	29-Jul	10:00	35.197	8.391
TGT-12	29-Jul	10:08	30-Jul	10:15	44.708	17.826
TGT-13	30-Jul	11:58	31-Jul	10:00	22.024	11.634
TGT-14	31-Jul	10:03	1-Ago	10:17	35.037	9.390
TGT-15	1-Ago	10:23	2-Ago	12:30	52.624	30.436
TGT-16	2-Ago	12:00	3-Ago	10:00	57.659	14.258
TGT-17	3-Ago	10:05	4-Ago	9:58	31.202	9.624
TGT-18	4-Ago	10:01	5-Ago	10:25	49.523	19.179
TGT-19	5-Ago	10:30	6-Ago	10:05	18.871	7.390
TGT-20	6-Ago	10:15	7-Ago	10:10	17.262	5.856
TGT-21	7-Ago	10:25	8-Ago	12:25	21.561	10.854
TGT-22	8-Ago	12:45	9-Ago	12:50	31.413	13.511
TGT-23	9-Ago	13:00	10-Ago	10:40	25.044	16.643
TGT-24	10-Ago	10:45	11-Ago	10:45	23.230	7.443
TGT-25	11-Ago	10:48	12-Ago	10:48	23.670	10.112
TGT-26	12-Ago	10:53	13-Ago	10:49	16.489	11.979
TGT-29	13-Ago	11:03	14-Ago	10:10	16.879	14.788
TGT-30	14-Ago	10:15	15-Ago	12:55	21.763	14.006
TGT-27	15-Ago	13:00	16-Ago	12:45	24.558	11.069
TGT-28	16-Ago	13:00	17-Ago	12:30	40.309	15.497

1996

NOTA: :Gotuzzo se midió cada 12 horas PbF : 0>

(1) 000851

	1996		GOTUZZO	
			ng/m3	ng/m3
LabelGTZ	Hora Inic	Fecha Muestreo	**PbF**	**PbC**
GTZSA1	10:25	3-Jul	244.0	352.79
GTZSA2	23:12	3-Jul		101.44
GTZSA6	23:47	4-Jul	472.2	254.57
GTZSA3	12:03	5-Jul	495.0	642.86
GTZSA4	22:00	5-Jul	281.0	600.57
GTZSA5	21:45	6-Jul	112.7	
GTZSA7	19:10	7-Jul	299.0	150.61
GTZSA8	10:25	8-Jul	192.0	269.40
GTZSA12	22:15	8-Jul	311.0	357.11
GTZSA9	11:10	9-Jul	252.0	635.95
GTZSA10	22:10	9-Jul	351.0	287.37
GTZSA11	10:15	10-Jul	365.0	617.53
GTZSA13	21:15	10-Jul	311.0	502.03
GTZSA14	10:45	11-Jul	381.0	877.71
GTZSA16	22:06	11-Jul	361.0	1112.87
GTZSA15	10:20	12-Jul	500.0	443.37
GTZSA17	21:00	12-Jul	224.0	1203.18
GTZSA18	19:40	13-Jul	275.0	206.52
GTZSA22	10:01	14-Jul	80.6	56.25
GTZSA19	21:25	14-Jul	81.9	94.53
GTZSA20	10:15	15-Jul	103.7	100.38
GTZSA21	22:35	15-Jul	86.8	63.69
GTZSA23	11:30	16-Jul	164.2	116.89
GTZSA24	22:40	16-Jul	173.5	234.72
GTZSA25	10:20	17-Jul	328.0	304.07
GTZSA29	21:32	17-Jul	346.0	293.84
GTZSA26	10:25	18-Jul	292.0	259.79
GTZSA30	21:50	18-Jul	396.0	413.88
GTZSA28	10:15	19-Jul	310.0	338.40
GTZSA32	21:35	19-Jul	540.0	541.28
GTZSA31	10:15	20-Jul	269.0	353.82
GTZSA27	22:45	20-Jul	289.0	660.04
GTZSA34	10:05	21-Jul	218.0	157.58
GTZSA35	21:50	21-Jul	58.9	77.90
GTZSA36	10:30	22-Jul	170.7	119.31
GTZSA33	22:10	22-Jul	209.0	178.71
GTZSA38	10:15	23-Jul	273.0	216.62
GTZSA37	21:35	23-Jul	306.0	445.64
GTZSA39	10:15	24-Jul	241.0	295.52
GTZSA42	21:45	24-Jul	381.0	1188.76
GTZSA40	10:15	25-Jul	176.0	261.78
GTZSA41	21:32	25-Jul	256.0	197.63
GTZSA44	10:17	26-Jul	418.0	268.86
GTZSA43		26-Jul		
GTZSA45	10:28	27-Jul	210.0	168.06
GTZSA48	22:02	27-Jul	336.0	316.28
GTZSA47	10:10	28-Jul	163.9	115.89
GTZSA49	22:00	28-Jul		207.63
GTZSA51	10:57	29-Jul	172.4	269.67
GTZSA56	21:20	29-Jul	233.0	651.49
GTZSA52	10:45	30-Jul	249.0	273.24
GTZSA55	22:19	30-Jul	198.0	269.11
GTZSA54	10:20	31-Jul	132.9	99.00
GTZSA58	21:21	31-Jul	343.0	248.59

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GTZSA59	10:10	1-Ago	265.0	185.65
GTZSA60	22:30	1-Ago	149.2	176.02
GTZSA57	10:20	2-Ago	27.2	
GTZSA53	21:30	2-Ago	346.0	315.61
GTZSA62	10:10	3-Ago	220.0	110.94
GTZSA63	22:15	3-Ago	377.0	157.42
GTZSA64	10:10	4-Ago	167.6	79.35
GTZSA61	21:40	4-Ago	151.8	162.05
GTZSA65	10:35	5-Ago	101.5	92.88
GTZSA66	22:00	5-Ago	163.2	119.51
GTZSA67	9:55	6-Ago	230.0	179.33
GTZSA68	21:23	6-Ago	414.0	604.82
GTZSA69	9:50	7-Ago	135.3	57.84
GTZSA70	22:29	7-Ago	69.8	59.47
GTZSA71	10:27	8-Ago	93.3	49.99
GTZSA72	21:22	8-Ago	280.0	289.92
GTZSA73	9:50	9-Ago	242.0	116.28
GTZSA74	21:21	9-Ago	262.0	371.94
GTZSA78	10:08	10-Ago	190.0	99.70
GTZSA75	21:41	10-Ago	263.0	208.70
GTZSA76	9:00	11-Ago	174.6	128.29
GTZSA77	21:16	11-Ago	195.0	225.25
GTZSA79	10:25	12-Ago	117.2	57.50
GTZSA80	21:51	12-Ago	108.2	63.18
GTZSA81	10:00	13-Ago	80.6	57.43
GTZSA83	21:32	13-Ago	198.0	156.88
GTZSA82	10:13	14-Ago	253.0	181.00
GTZSA84	21:52	14-Ago	232.0	349.86
GTZSA85	11:00	16-Ago	208.0	198.33
GTZSA86	22:05	16-Ago	401.8	511.67
GTZSA87	10:00	17-Ago	176.1	131.49
GTZSA88	22:05	17-Ago	105.2	60.85
GTZSA89	10:05	18-Ago	91.4	56.51
GTZSA90	23:27	18-Ago	84.0	78.87
STHSA50	12:04	23-Ago	88.0	
STHSA51	21:17	23-Ago	88.3	
STHSA52	10:20	24-Ago	24.0	78.55
STHSA53	23:15	24-Ago	83.3	
STHSA54	10:10	25-Ago		
STHSA55	22:17	25-Ago		
STHSA56	10:25	26-Ago		
STHSA57	21:55	26-Ago		142.28
STHSA58	10:30	27-Ago		
STHSA59	22:30	27-Ago		
STHSA60	9:40	28-Ago		
STHSA61	22:40	28-Ago		458.29
GTZSA91	10:23	29-Ago	117.3	114.15
GTZSA92	21:17	29-Ago	176.1	211.59
GTZSA93	9:58	30-Ago	196.0	140.01
GTZSA94	20:59	30-Ago	72.5	57.75
GTZSA98	10:00	31-Ago	245.0	
GTZSA97	22:15	31-Ago	83.1	

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ß > 2.5 µg   PbC · 2.5>×>10

1996			CERRO	CALAN
			ng/m3	ng/m3
LabelLCD	Hora Inic	Fecha Muestreo	PbF	PbC
LCDSA1	9:30	10-Jul	118.4	122.77
LCDSA2	9:30	11-Jul	55.5	
LCDSA3	10:30	12-Jul	78.9	
LCDSA4	9:45	15-Jul	165.8	
LCDSA5	9:30	16-Jul	122.6	106.80
LCDSA6	9:30	17-Jul	152.9	
LCDSA7	9:20	18-Jul	158.5	
LCDSA8	9:30	20-Jul	103.7	
LCDSA9	10:00	21-Jul	89.3	
LCDSA10	9:20	22-Jul	99.7	
LCDSA11	10:30	23-Jul	103.4	127.12
LCDSA12	9:20	24-Jul	121.9	
LCDSA13	9:00	25-Jul	78.5	
LCDSA14	9:00	26-Jul	28.1	
LCDSA15	10:15	27-Jul	58.5	28.01
LCDSA16	9:40	28-Jul	33.1	
LCDSA17	9:30	29-Jul	84.4	79.87
LCDSA18	9:30	30-Jul	85.7	
LCDSA19	11:45	31-Jul	72.3	
LCDSA20	9:45	1-Ago	145.6	138.00
LCDSA21	9:25	2-Ago	41.8	
LCDSA22	10:30	3-Ago	91.4	
LCDSA23	10:22	4-Ago	43.9	
LCDSA24	13:00	5-Ago	30.1	
LCDSA25	9:10	6-Ago	47.3	
LCDSA26	9:15	7-Ago	76.9	
LCDSA27	8:20	8-Ago	45.3	
LCDSA30	14:30	9-Ago	106.3	82.23
LCDSA29	8:10	10-Ago	30.7	
LCDSA31	10:45	11-Ago	74.6	
LCDSA32	12:00	12-Ago	37.9	
LCDSA33	11:05	13-Ago	47.5	24.60
LCDSA34	9:15	14-Ago	96.0	
LCDSA35	11:40	15-Ago	30.2	
LCDSA36	9:20	16-Ago	106.2	79.76
LCDSA37	10:58	17-Ago	83.6	
LCDSA38	10:25	18-Ago	53.2	
LCDSA39	12:45	19-Ago	57.3	16.72
LCDSA40	10:00	20-Ago	75.8	84.30
LCDSA41	13:30	21-Ago	62.0	
LCDSA42	16:00	23-Ago	58.5	36.50
LCDSA43	10:35	24-Ago		
LCDSA44	11:30	25-Ago	66.8	
LCDSA45	12:00	26-Ago	44.1	
LCDSA46	9:30	27-Ago	33.0	55.63
LCDSA47	9:15	29-Ago	68.7	
LCDSA48	12:15	30-Ago	24.7	
LCDSA49	11:10	31-Ago	82.4	103.70
LCDSA50	9:00	1-Sep	56.3	
LCDSA51	10:00	2-Sep	55.2	
LCDSA52	10:45	3-Sep	48.1	101.47
LCDSA53	9:30	4-Sep	37.4	
LCDSA54	8:30	5-Sep	38.8	
LCDSA55	9:15	6-Sep	26.1	
LCDSA56	10:00	7-Sep	67.3	48.59
LCDSA57	10:00	8-Sep	27.7	
LCDSA58	9:15	10-Sep	51.6	
LCDSA59	11:00	11-Sep	30.5	
LCDSA60	9:15	12-Sep	75.8	64.51
LCDSA61	9:00	13-Sep	45.8	
LCDSA62	10:00	14-Sep	25.4	
LCDSA63	11:30	15-Sep	30.7	

	1996		BUIN	
			ng/m3	ng/m3
LabelSTH	Hora Inic	Fecha Muestre	**PbF**	**PbC**
STHSA1	8:00	4-Jul	47.0	14.26
STHSA2	8:00	5-Jul	73.3	
STHSA3	8:00	6-Jul	53.5	15.41
STHSA4	8:00	7-Jul	20.3	
STHSA5	8:00	8-Jul	24.7	8.64
STHSA6	8:00	9-Jul	34.3	
STHSA7	8:00	10-Jul	35.1	
STHSA8	8:00	11-Jul	32.2	
STHSA9	8:00	12-Jul	71.4	
STHSA10	8:00	13-Jul	42.0	
STHSA11	8:00	14-Jul	32.6	32.26
STHSA12	8:00	15-Jul	15.7	
STHSA13	8:00	16-Jul	17.5	
STHSA14	8:00	17-Jul	37.4	
STHSA15	8:00	18-Jul	49.0	19.47
STHSA16	8:00	19-Jul	49.4	
STHSA17	8:00	20-Jul	52.7	29.91
STHSA18	8:00	21-Jul	34.3	
STHSA19	8:00	22-Jul	19.6	
STHSA20	8:00	23-Jul	8.6	17.76
STHSA21	8:00	24-Jul	30.0	
STHSA22	8:00	25-Jul	34.2	
STHSA23	8:00	26-Jul	42.6	
STHSA24	8:00	27-Jul	30.4	15.69
STHSA25	8:00	28-Jul	16.5	
STHSA26	8:00	29-Jul	27.4	
STHSA27	8:00	30-Jul	25.6	
STHSA28	8:00	31-Jul	20.7	
STHSA29	8:00	1-Ago	28.8	
STHSA30	8:00	2-Ago	24.5	14.51
STHSA31	8:00	3-Ago	36.0	
STHSA32	8:00			
STHSA33	8:00	5-Ago	10.3	5.28
STHSA34	8:00	6-Ago	13.3	
STHSA35	8:00	7-Ago	25.2	
STHSA36	8:00	8-Ago	11.7	5.16
STHSA37	8:00	9-Ago	19.7	
STHSA38	8:00	10-Ago	23.3	
STHSA39	8:00	11-Ago	35.6	20.07
STHSA40	8:00	12-Ago	14.9	9.08
STHSA41	8:00	13-Ago	15.6	
STHSA42	8:00	17-Ago	16.4	10.53
STHSA43	8:00	18-Ago	30.9	
STHSA44	8:00	19-Ago	25.8	
STHSA45	8:00	20-Ago	33.6	
STHSA46	8:00	21-Ago	15.7	3.53
STHSA47	8:00	22-Ago	35.8	
STHSA48	8:00	23-Ago	14.1	