



***PREVENTING LEAD POISONING IN THE
AMERICAS: HEALTH, ENVIRONMENT,
AND SUSTAINABLE DEVELOPMENT***

***April 17-18, 1998
Santiago, Chile***

CONFERENCE AND WORKSHOP REPORT

Alliance To End Childhood Lead Poisoning



The **Alliance To End Childhood Lead Poisoning** is a non-profit public interest organization dedicated to eliminating lead poisoning in the United States and throughout the world. The Alliance was formed in 1990 by nationally and internationally recognized leaders in the diverse fields needed to mount an effective interdisciplinary attack on lead poisoning: environmental protection, public health, low-income housing, environmental justice, education, pediatrics, occupational health and safety, children's welfare, and civil rights.

The Alliance's mission is to frame the agenda, formulate innovative approaches, and bring critical resources to bear – scientific and technical knowledge, public policy, economic forces, other organizations, and community leaders – to prevent lead poisoning. The Alliance's activities include:

Education to inform policy makers and the public of lead hazards and the benefits of prevention.

Policy Support to develop prevention strategies and programs at the community, national, and international levels.

Advocacy to implement prevention strategies by changing public policy, enlisting the private sector in solutions, and mobilizing other resources and organizations.

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**Alliance To End Childhood Lead Poisoning
La Casa De la Paz
La MUTUAL DE SEGURIDAD DE CHILE
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION**

Acknowledgments

The final report of the hemispheric conference, *Preventing Lead Poisoning in the Americas: Health, Environment, and Sustainable Development*, contains summaries of conference presentations and panels, and the results of a policy workshop of technical experts. This document is a synthesis of the presentations and discussions that took place at the events. This report was prepared by Arturo Garcia-Costas and Maria Rapuano. The translation into Spanish was conducted by Jorge and Carmen Varela. The conference and workshop could not have taken place without the dedication and work of our co-sponsors and many other organizations and individuals who contributed their time and resources to these events. We would like to extend our appreciation to conference and workshop co-sponsors, la Casa de la Paz, la Mutual de Seguridad de Chile, and Science Applications International Corporation (SAIC). The contribution of services and information provided by the following organizations is also appreciated: the National Archives of Chile; Corporación Participa; and the International Institute for Energy Conservation. We would also like to extend special thanks to the following individuals, whose efforts were key to the success of these meetings: Ximena Abogobir; Lisette Balmaceda Francois; Mauricio Escalona Vivanco; and Carlos Arroyo. Finally, we would like to thank the many speakers and panelists.

The content of this report and the summaries of the presentations were derived from the official proceedings of the meetings. This report reflects the views of the presenters, which are not necessarily held by the sponsoring organizations.

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I. INTRODUCTION AND PURPOSE

On Friday, April 17, 1998 the Alliance To End Childhood Lead Poisoning, la Casa de la Paz, la Mutual de Seguridad de Chile, and Science Applications International Corporation held a one-day regional conference, *Preventing Lead Poisoning in the Americas: Health, Environment, and Sustainable Development*. The meeting was held at the National Archives in Santiago, Chile. The meeting was designed to coincide with the latest Summit of the Americas (April 18-19), also held in Santiago Chile, and to take advantage of the opportunity it provided to increase awareness of lead poisoning and its solutions and to discuss implementation strategies to fulfill previous commitments to prevention. (Lead poisoning prevention, including leaded gasoline phase-out, was one of the commitments made by the hemisphere's democratically elected leaders at the first Summit of the Americas held in Miami in December, 1994.)

More than 70 participants attended the conference. They included representatives of every field with a stake in lead poisoning prevention in the hemisphere, including government agencies (at the federal, regional, and local levels), nongovernmental organizations, the press, academia, health professionals, legal and public policy experts, occupational health and safety professionals, the private sector, and international institutions. The conference featured an array of presenters and panelists from key international, regional, and national organizations. In addition to representatives from the World Bank, the Pan-American Health Organization and the Latin American Energy Organization, participants heard presentations from NGO representatives and government officials from Chile, Peru, and Ecuador.

The conference laid a groundwork of common knowledge to enable the development of effective solutions to lead poisoning. It accomplished the following specific objectives:

- Showcased model interdisciplinary approaches and practices to achieve hemispheric progress on the phase-out of leaded gasoline;
- Rallied action for a hemispheric phase-out of leaded gasoline by the year 2001;
- Educated the media in attendance at the Summit on lead poisoning in general and leaded gasoline phase-out in particular;
- Engaged policy-makers, the private sector, and NGOs in building partnerships for solutions;
- Began building a global lead poisoning prevention network consisting of NGOs, professionals, and academics;
- Highlighted lead poisoning as a critical challenge to sustainable development in the hemisphere;
- Formally released the Spanish language versions of the Alliance's *International Action Plan for Preventing Lead Poisoning and Myths and Realities of Phasing Out Leaded Gasoline*.

The conference was followed by a small *Hemispheric Policy Workshop of Technical Experts* on Saturday, April 18. This workshop was by invitation only in order to keep its size small enough to allow for substantive discussion. Ten representatives of NGOs, national agencies, and intergovernmental institutions attended (a list of the participants can be found in Appendix C). Workshop participants were charged with developing a set of recommendations for regional and national strategies for preventing lead poisoning, building

on the Alliance's *International Action Plan for Preventing Lead Poisoning* and the information that was presented during the conference on the previous day.

Workshop discussion centered on the importance of the community right-to-know principle in the context of lead poisoning prevention, the possible opportunities for monitoring and controlling trade in consumer products containing lead as part of regional efforts to establish a Free Trade Area of the Americas, and the need to establish and enforce protective standards to limit exposure. The strategies and recommendations developed at this workshop will be disseminated throughout the region to be used as an outreach and policy development tool.

The following section contains a summary of the Conference's presentations and discussions. The concluding section contains a summary of the workshop. A Conference agenda and lists of Conference and Workshop participants can be found in the appendices.

A copy of the Conference Agenda can be found in Appendix A. After the Opening Address, which was delivered by Horst Otterstetter, Director of the Environment and Health Division of the Pan-American Health Organization, a series of speakers and panels addressed issues ranging from the phase-out of leaded gasoline, to preventing lead exposure from other sources, to the role of civil society in prevention. The Closing Address was

II. CONFERENCE SUMMARY

delivered by Roberto Belmar of the Chilean Ministry of Health.

A. Opening Address

Dr. Horst Otterstetter, Director of the Environment and Health Division of the Pan American Health Organization (PAHO), delivered the opening address, which emphasized PAHO's long-standing commitment to lead poisoning prevention in the hemisphere and set forth the organization's current priorities and activities on this issue. Otterstetter stressed the following key points:

- Lead pollution is a prime example of an obstacle to sustainable development caused by modern industrial activity. Because its effects on the human body are irreversible and because it persists as an environmental pollutant indefinitely, lead contamination is clearly a burden we are passing on to future generations.
- Eliminating lead from gasoline should be only the first, albeit a crucial, step in a broader national effort to address and control all sources of lead exposure and poisoning.
- Lead poisoning is also a key example of a threat to public health and environmental quality that necessitates a multidisciplinary approach. Treating disease is a medical issue, but to effectively protect the public health other disciplines and perspectives must be brought to bear in the design, management, and administration of solutions. Each sector and discipline has its role to play in preventing lead poisoning and must be engaged.
- In addition, information exchange among the spectrum of relevant disciplines is

fundamental to successfully addressing the challenge to sustainable development represented by lead pollution.

Otterstetter also summarized the role that PAHO has played, and continues to play, in addressing lead poisoning in the hemisphere. PAHO has three main areas of focus: 1) Occupational exposure (defined broadly to encompass the overall health of the worker and his family and not just conditions in the workplace); 2) Childhood exposure; and 3) Contamination and exposure resulting from mining-related activities.

Through its in-country representatives, PAHO works closely with the Health Ministries of the region to identify and monitor key threats to public health within and across national borders and provides direct technical assistance to address these threats. With offices in every country in the hemisphere, the organization also can be an invaluable information resource for government officials, NGOs, and academic institutions. For example, PAHO runs a clearinghouse for the latest research on the effects of lead and other heavy metals on the human body. In addition, PAHO can serve as a bridge between those countries who have already developed a high level of capacity in a particular area and those countries in need of support.

B. Global Dimensions of Lead Poisoning: A Challenge to Sustainable Development

Maria Rapuano, Project Director for the Alliance To End Childhood Lead Poisoning, United States, described how the effects of lead on the environment, health, and society make lead a sustainable development issue of global proportions. As is the case with many sustainable development issues, vulnerable populations, such as children

and the poor, suffer disproportionately from lead poisoning. Poor populations are particularly vulnerable because an inadequate diet, lacking nutrients such as iron and calcium, causes the body to absorb more of the lead that is ingested. In addition, limited water supplies could make washing food and cleaning living spaces difficult. Finally, poor people tend to be exposed to higher levels of lead by living in more highly contaminated areas or working in dangerous occupations.

Children are more susceptible to lead's harmful effects because their brains and nervous systems are developing rapidly. Lead disrupts this normal development, causing a reduction in IQ, learning disabilities, hyperactivity, and other behavioral problems. For example, the World Bank has estimated that the average child living in Manila lost an average of between 2.2 and 6.4 IQ points due to exposure to lead in gasoline. These effects occur at very low levels of exposure, are long-term, and may be irreversible.

In adults, even very low levels of lead cause a small but significant increase in blood pressure. Hypertension from lead exposure is estimated to be responsible for tens of thousands of premature deaths each year, especially in men aged 40 to 59. Lead also adversely affects other organs and systems such as the kidney, liver, and reproductive system. Before leaded gasoline was phased out in Cairo, the World Bank estimated that 10,000 adults died prematurely as a result of heart attacks or strokes caused by lead exposure each year.

The devastating effects of lead on health, the economy, and future generations clearly makes lead poisoning an urgent international sustainable development problem. The long-term effects of lead poisoning for the individual, in terms of lost

future productivity, lifetime earnings, and quality of life, can be devastating. The consequences of lead poisoning for society include increased health care costs, lost national competitiveness, and reduced national productivity. Furthermore, since lead is an element and does not break down or degrade once it has been deposited in the human environment, this hazard remains to poison future generations until it is controlled or removed.

The further tragedy of lead poisoning is that it is completely preventable – and prevention is critical, since once a child is poisoned it is too late to reverse the neurological damage that has been done. There is no cure for lead poisoning save prevention. Sources of lead in the environment must be controlled or removed before children are poisoned.

Once lead has been deposited in the human environment, this hazard remains to poison future generations until it is controlled or removed.

Solving this international environmental health problem, while a signal victory in and of itself, can also serve as a model for solving other sustainable development problems the world faces. For example, lead is also

a multidisciplinary problem (including health, environment, occupational health and safety, energy, transportation, etc.) requiring an interdisciplinary solution and the involvement of civil society – two basic sustainable development principles identified by the Brundtland Commission and Agenda 21. In addition, lead poisoning prevention provides a ready opportunity for government leadership to demonstrate results.

C. The Life Cycle of Lead as an Environmental Pollutant: The Case of Leaded Gasoline Phase-Out

Maria Rapuano, Project Director for the Alliance To End Childhood Lead Poisoning, United

States, described how lead contaminates the environment and endangers health through every stage of its life cycle and explained why leaded gasoline phase-out is an urgent international environmental health priority.

While lead is a naturally occurring element in the Earth's crust, it does not become bioavailable until it is mined and used by humans. Lead can be released into the human environment and pose a health hazard through all stages of its life cycle: beginning with mining; through smelting and refining; during the manufacture of lead-containing products; by using lead-containing products; and with their disposal or recycling. Worldwide, six sources appear to account for the most significant lead exposures in children and the general public: gasoline additives; food can solder; lead-based paints; ceramic glazes; drinking water systems; and cosmetics and folk remedies. Other sources that can cause significant exposures in local areas are inadequately controlled industrial and cottage industries.

Lead from all these sources gets into the human body through a variety of pathways, including air, water, soil, and dust. Lead-contaminated dust and soil are the most common pathways for young children, who explore their worlds by putting objects and their fingers in their mouths. Even an invisible residue of lead dust on these objects presents a significant hazard.

Even though leaded gasoline additives constitute only a minor fraction of global lead use (only about two percent of the world's lead production is used for leaded gasoline), it has disproportionate environmental significance. In addition, leaded gaso-

line additives are one of the most dangerous forms of lead. When leaded gasoline is burned, very small particles of lead can be inhaled and reach the deepest part of the lungs, where they will be absorbed with almost 100% efficiency. Lead particles eventually fall out of the air to the ground, contaminating dust and soil, where they will remain to poison generations of children until abated. In the U.S. for example, where leaded gasoline phase-out was completed in 1995, it is estimated that four to five million tons of lead from car exhausts remain in the soil and dust along roadsides. Therefore, every day of continued leaded gasoline use counts, especially in countries where vehicle use and traffic density are increasing rapidly. The World Bank estimates that use of leaded gasoline accounts for up to 90% of the lead in the air of many cities.

Countries that have already taken action to eliminate the use of leaded gasoline have reaped significant health benefits as a result. The comprehensive National Health and Nutrition

Examination Surveys by the U.S. Centers for Disease Control and prevention confirm that although almost one million U.S. children are still lead poisoned, there has been a significant drop in average blood lead levels in children in the U.S. over the past decade. As a result of the virtual elimination of leaded gasoline, average blood lead levels in the U.S. population decreased by 77% between the years of 1976 and 1991. Experts attribute this drop in mean blood lead levels largely to the phase-out of lead from gasoline. In health costs alone, the U.S. has saved hundreds of millions – probably even billions – of dollars from leaded gasoline phase-out. When these savings are combined with savings in vehicle maintenance, it is estimated that the U.S. saved \$10 for every \$1 invested.

Developed and developing countries that have already phased out leaded gasoline have demonstrated that it is practicable, cost-beneficial, and can be done quickly.

Despite these proven benefits, progress on the global phase-out of leaded gasoline has been slow and erratic. A primary cause of continued leaded gasoline use is the perpetuation of certain myths designed to discourage the switch from leaded to unleaded gasoline. These myths include: the myth that older cars need leaded gasoline; the myth that the cost of switching from leaded to unleaded gasoline is too high, especially for developing countries; and the myth that the introduction of unleaded gasoline increases human health risks because unleaded gasoline necessarily contains higher concentrations of benzene, a known carcinogen.

In truth, not phasing out leaded gasoline costs too much – in terms of health, education, and lost productivity and national competitiveness. In addition, older cars do not need leaded gasoline – and its continued use costs vehicle owners hundreds of dollars each year in vehicle maintenance. Finally, there are many ways

to produce unleaded gasoline without increasing the benzene content. Eliminating lead from gasoline can and must be carried out in a manner that improves public health, including regulating the level of benzene allowed in gasoline.

Countries that have already phased out leaded gasoline have demonstrated that it is practicable, cost-beneficial, and can be done quickly in both developed and developing countries. The international commitment, technology, and resources for a worldwide phase-out of leaded gasoline are now in place. All that is missing is the political

will to take advantage of this opportunity and to carry out existing commitments to eliminate leaded gasoline.

D. Leaded Gasoline Phase-Out: The Case of Peru

Gregorio Neglia, Coordinator of the Air Quality and Leaded Gasoline Phase-Out Program of the Ministerio de Transportes, Comunicaciones, Vivienda y Construcción (Ministry of Transportation, Communications, Housing and Construction), Peru, presented an overview of the significant progress Peru has made in the last two years in fulfilling its Summit of the Americas commitment to develop and implement a national plan for the phase-out of leaded gasoline.

ment to develop and implement a national plan for the phase-out of leaded gasoline.

In June of 1997 a special commission was created by presidential decree to design an integrated approach to improving air quality and phasing out leaded gasoline. The Ministries of Health; Energy and Mines; and Transportation, Communications, Housing and Construction were represented on this commission.

The commission established working groups to address key areas. These working groups sought the advice and comments of various stakeholder institutions as part of an effort to develop national standards for air quality and vehicle emissions and protocols for environmental monitoring and fuel specifications. As a result of these efforts, Peru is ready to introduce into its national legislature a law that establishes national ambient air quality standards and it is preparing legislation that would set emission limits for motor vehicles, including used vehicles from countries such as Japan that are beginning to flood Peru's market.

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A key socioeconomic issue that the commission must take into account in preparing its plan is the effect of phase-out on the various small and isolated refineries operating in the country. These refineries need time to make the necessary investments in upgrades – in other words, mandating immediate elimination of leaded gasoline could result in their closure.

Another key issue that Peru is wrestling with at present is the price structure for its fuels. The government has been using its tax system to promote consumption of diesel and liquefied natural gas. The incentive to consumers to use diesel fuel has resulted in a negative environmental impact caused by the commensurate increase in air-born particulates.

In the case of gasoline, the commission's on-going negotiations with the refineries have resulted in an agreement to completely phase out the 95 octane leaded gasoline currently being marketed to consumers. It is estimated that elimination of this grade will result in an immediate 12% reduction in lead pollution. However, the leaded 84 octane grade is the least expensive and the most popular, causing problems with consumer misfueling or even making changes to their cars to make use of this grade of gasoline. In addition to the obvious economic incentive to buy the 84 octane, its popularity among consumers is due in large part to the perception by consumers that older cars can only run on leaded gasoline.

As a result of this misperception, the commission has identified the need to raise public awareness about the dangers of lead poisoning and the advantages of using unleaded gasoline. As a tool to help raise consciousness about the effects of leaded

gasoline on public health, the government has begun to screen selected urban populations including school age children and pregnant women. In addition, the government is interested in highlighting other significant sources of lead exposure such as lead-based paint, which is still sold in Peru, and ceramic glazes.

Neglia stressed that the inter-sectoral nature of this problem requires a sustained, constructive dialogue between the key stakeholders. Each must make an effort to understand the perspectives and priorities of the others in order to reach a national consensus on how best to move forward as rapidly as possible.

E. Leaded Gasoline Phase-Out in the Americas Panel

Robin Rosenberg, Deputy Director of the North-South Center of the University of Miami, United States, kicked off the panel by summarizing hemispheric efforts to phase out leaded gasoline in the con-

text of the Summit of the Americas process. Rosenberg emphasized that leaded gasoline phase-out represents one of the success stories from the Summit of the Americas process that began in Miami in December, 1994. In fact, out of the more than 200 individual action items included in the action plans that came out of Miami, and the subsequent Summit of the Americas on Sustainable Development held in Santa Cruz, Bolivia in December, 1996, the commitment for national governments to develop and implement national plans to phase-out leaded gasoline has enjoyed the greatest momentum.

Rosenberg identified four concrete reasons why the commitment on leaded gasoline phase-out has been so much more successful than other agree-

ments. First, the language of the agreement to develop national action plans to phase out leaded gasoline was very specific. There was no question about what governments were supposed to do to honor that agreement. Second, the World Bank and U.S. EPA provided technical assistance to help governments develop and implement their action plans. Third, there was the sustained interest of civil society organizations in the issue. Fourth, (partly as a result of the pressure provided by the first three factors) national governments have been willing (for the most part) to devote the necessary resources to this effort.

According to the World Bank, if the efforts under the Summit of the Americas are implemented successfully, 86% of the gasoline sold in the hemisphere could be lead-free by 2001. However, much remains to be done and this goal will not be reached unless those countries that have not successfully accomplished phase-out continue to receive attention and support.

Leaded gasoline phase-out in the hemisphere can serve as a model for successful implementation of the types of international commitments on the environment and sustainable development that have emerged over the last four years. For example, Rosenberg stated that governments must be pushed to be more concrete in the promises they make. These promises must include achievable milestones and timelines for planning and implementation. In addition, governments must be prepared and be able to assign adequate resources to meet the obligations contained in these agreements.

Finally, Rosenberg placed a particular emphasis on the importance of accountability and the need

to monitor implementation of the commitments and initiatives that emerge from the on-going Summit of the Americas process, (with civil society playing a crucial role) if sustainable development is ever to be more than a lofty ideal, much discussed but never achieved.

Magda Lovei, Senior Economist in the World Bank's Environment Division, reported on the Bank's "Regional Technical Assistance Project for the Phase-Out of Leaded Gasoline," designed to complement and support national efforts to implement the Summit of the Americas commitment. This Regional Project has facilitated hemispheric efforts to phase out leaded gasoline in a number

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of ways. Together with the Organization of American States, the Bank convened an Ad Hoc Working Group for the project that included representatives from hemispheric institutions such as the Pan-American Health Organization; technical agencies, such as the U.S. Department of Energy and the Environmental Protection Agency; and the non-governmental community.

This working group helped to share information and coordinate multilateral and bilateral assistance and projects related to leaded gasoline phase-out in the region. This group recommended that the Bank ask governments to formally designate national focal points (individuals responsible for coordinating their government's participation in the project) for leaded gasoline phase-out. Once this was done, the Bank designed and distributed a hemispheric survey to the focal points in an effort to gather information on existing conditions and policies that have a bearing on leaded gasoline phase-out. These activities culminated in a Hemispheric Workshop of National Officials held in Santiago, Chile in September, 1996 where the results of the survey were formally released and par-

ticipants discussed key policy and technical issues and made recommendations for binding commitments.

In the months following the Santiago meeting, the Bank began to focus on providing concrete assistance to particular countries. The Bank's country-specific efforts have included working with governments to address fuel quality and specification issues, supporting feasibility studies for refinery upgrades, and helping to incorporate leaded gasoline phase-out into ongoing pollution control or environmental improvement activities. Lovei cited the Bank's activities in Peru as a concrete example.

Lovei called the progress made since the Summit of the Americas impressive, given that as of this year, 14 countries have completely phased out leaded gasoline and that since 1990 the amount of lead emitted into the environment as a result of burning leaded gasoline has fallen from 27,000 to 8,000 tons of lead per year. She further noted that assuming successful implementation of current phase-out plans, this figure would drop to 4,000 tons a year by the year 2000. In addition, the Regional project has clearly accelerated phase-out efforts. In 1996, the Dominican Republic, Haiti and Paraguay had no firm plans to phase out leaded gasoline. Now, all three countries have committed themselves to eliminate leaded gasoline by the year 2000.

However, it is important to emphasize there is still work to be done. In the year 2000 the countries of the region will still be emitting 4,000 tons of lead into the environment as a result of the continued use of leaded gasoline – and Venezuela alone will be responsible for nearly 70% of the total. Venezuela is the only country in the hemisphere where

unleaded gasoline is not available in the domestic market – even though unleaded fuels are produced for export, they will not be made available to Venezuelan consumers until 1999.

Lovei characterized leaded gasoline phase-out as a “no regrets” policy because all technical and economic studies illustrate the clear benefits to vehicle maintenance, air quality, and public health that accrue as a result. However, she acknowledged that in some cases, the phase-out can be a difficult and complex process that involves multiple stakeholders and interest groups. In its country-specific activities, the Bank has consistently made an effort to strengthen political commitment for phase-out by reaching out to a variety of stakeholders and catalyzing or facilitating a constructive dialogue among them on the issue.

Leaded gasoline phase-out is a “no regrets” policy because all technical and economic studies illustrate the clear benefits to vehicle maintenance, air quality, and public health that accrue as a result.

Carlos Jaramillo, Senior Advisor with the Organización Latino Americana de Energía (Latin American Energy Orga-

nization), discussed his organization's efforts to promote harmonization of fuel standards (including leaded gasoline phase-out) in the hemisphere and the ramifications of harmonization for the regional economy and environment. He stressed that harmonizing fuel standards necessarily involves more than simply the refining sector – it also affects the vehicle manufacturing sector at a fundamental level. Thus, the structure and character of the region's refining sector and the composition, age, and origin of the vehicle fleet in the hemisphere have been considered in the new fuel standards that OLADE has developed.

Harmonization of regional fuel specifications has been under discussion at OLADE for many years due to the recognition of the profound implications for international trade if such an effort were

successful. In addition to its effect on the international trade in fuels, there would likely be significant effects on the licensing and transfer of vehicle manufacturing technologies to the region. Currently, individual countries of the region are at a disadvantage when negotiating with major multinationals like Toyota or Mazda for the licensing of technology. Jaramillo contended that harmonization would place Latin American countries in a much stronger negotiating position for determining the kind of technology that is incorporated into the cars manufactured, assembled, or sold within their borders.

Jaramillo announced that the 26 nations that make up the member-states of OLADE have reached consensus on fuel specifications for unleaded gasoline and have agreed to harmonize their fuel production by the year 2005. According to Jaramillo, this was not some theoretical date arrived at by diplomats who have no inkling of the technical issues involved; rather the 2005 date is the result of negotiations between national experts and is considered readily achievable with an appropriate degree of investment.

Jorge Oviedo, Director of the Urban Ecology Program of Fundación Natura (Nature Foundation), Ecuador, discussed the role his organization has played in Ecuador's efforts to phase out leaded gasoline. He informed participants that the possibility of phasing out leaded gasoline had been discussed by officials in his government since 1987. However, progress was paralyzed by concerns raised at that time that phasing out the use of lead would necessarily result in an increase in aromatics and, by extension, an increase in cancer rates. Thus, the nature of the discussion centered around which was worse, increased risk of

cancer or the constellation of health and developmental problems caused by exposure to lead. Fundación Natura decided to attempt to break this philosophical logjam with a series of studies and policy papers.

At the outset, Oviedo contended that the aromatics/lead pollution discussion was based on faulty reasoning and, thus, was a false choice. Comparative risk aside, phasing out lead from gasoline must be the priority because eliminating leaded gasoline is the key to beginning to address the spectrum of pollutants vehicles emit into the atmosphere. As long as leaded gasoline is sold in its domestic market, a country impedes the introduction of catalytic converters forfeiting the enormous

improvement in urban air quality they provide.

Phasing out lead from gasoline must be a priority as it is the key to beginning to address the spectrum of pollutants vehicles emit into the atmosphere.

In an attempt to catalyze action, Fundación Natura designed and conducted a screening study in Quito in 1991. Their first step was to articulate the key dangers associated with exposure to lead. Oviedo highlighted the fact that

lead is one of the few toxins that can pass through the placental barrier to the fetus; that lead exposure has been shown to result in developmental retardation of cognitive abilities and reflexes in children; and that it contributes to hypertension and, by extension, to increased mortality from strokes and heart attacks in adults.

The screening study included 265 people from a variety of exposure groups. Sixty-five percent of the newborns tested had elevated blood lead levels. One hundred percent of the school-age children tested had blood lead levels above 10 micrograms per deciliter ($\mu\text{g}/\text{dl}$) (the threshold of concern set by the U.S. Centers for Disease Control and Prevention), with the average being 28 $\mu\text{g}/\text{dl}$. In addition to screening for blood lead levels, they

followed up this initial project with a study that focused on the children's cognitive abilities and emotional health. As expected, they found a higher incidence of learning disabilities and short attention span problems in the lead-exposed population when compared to the control group.

Oviedo emphasized that the studies were performed as part of a strategy to illustrate to the government and the general public that there was a problem and to catalyze official action with respect to leaded gasoline phase-out. Their efforts met with some initial success in that the municipal authorities of Quito attempted to ban the sale of leaded gasoline within the city. Eventually all the major metropolitan centers of the country banned the sale of leaded gasoline, until, finally, the national legislature passed a law that required all gasoline sold in the country to be unleaded as of May, 1997. Petroecuador, the national refinery, failed to comply with this law, which prompted Fundación Natura to file a lawsuit to force compliance. (Oviedo's remarks during the "Best Practices" panel, below, describe the current status of the lawsuit.)

F. Panel on Lead Contamination in Antofagasta and Arica

Antofagasta and Arica are two Chilean communities facing enormous lead contamination problems. In Arica the environmental hazard menacing the community was the result of an unmanaged and unmarked toxic waste dump containing lead, arsenic, and other heavy metals in pulverized form. In Antofagasta, the lead contamination results from decades of transshipping and temporarily storing pulverized lead ore from Bolivia in an improper fashion before loading it onto ships. In both cases,

the extraordinarily dry climate of Northern Chile, which results in the continuing exposure to lead suspended in airborne dust, has exacerbated an already grave situation and resulted in extremely high blood lead levels in children and adults in the areas adjacent to the contaminated sites.

Jorge Lambeth, Consultant to Science Applications International Corporation (SAIC), Chile, served as the moderator and began the panel by setting forth its objective – to discuss and analyze, in a constructive manner, the problems facing the communities of Antofagasta and Arica as a result of their contamination with lead and other heavy metals.

The national legislature of Ecuador passed a law that required all gasoline sold in the country to be unleaded as of May, 1997.

Dr. Patricia Matus, Director of Standards, Guidelines, and Specifications, Comisión Nacional de Medio Ambiente (National Commission on the Environment), Chile, related her experience of the year before, when officials from the Ministry of

Health approached CONOMA with a request that the organization develop an ambient air standard for lead. At the time, there was opposition to such a standard because it was believed that it would shortly become irrelevant due to the rapid introduction of cars with catalytic converters in Chile. Even then, the objectors insisted, just because urban areas would soon come into compliance with such a standard did not mean that other parts of the country would follow suit. Now, as a result of the problems that have come to light in Antofagasta and Arica, CONAMA is in the process of formulating this standard.

Matus believes that two problems, in particular, contributed to the current situation in Arica and Antofagasta: 1) the lack of effective and enforceable standards governing the toxins; and 2) the

proximity of these health hazards to particularly vulnerable segments of the general public. For example, the disposition of the lead in the case of Antofagasta was governed by a bilateral treaty between Chile and Bolivia, which did not have any clauses or procedures designed to minimize environmental impacts. In the case of Arica, a Swiss company had previously contracted with a Chilean company to deliver a shipment of toxic waste supposedly for disposal through proper storage and recycling. If the same transaction were attempted today, it would come under the terms of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, which has established norms for international trade in such substances. According to Matus, the Basel Convention now prohibits situations where member-states of the Organization for Economic Cooperation and Development try to dump toxic wastes in the developing world.

Matus characterized both these situations as prime examples of the type of problems that Chile is facing after years of inadequate or nonexistent regulatory protections and procedures in the environmental area. She emphasized that in both of these cases, the national government had an oversight role, but that that role lacked an environmental perspective. The consequences and impacts on the nation's environment were simply not taken into consideration.

At present, CONAMA is seeking to forestall similar incidents from occurring in the future and to identify analogous situations that may currently exist to address them before they reach the crisis stage. In addition, the government is currently improving the country's environmental impact assessment procedures for activities such as the ones

that have caused contamination in Antofagasta and Arica so that environmental damage can be avoided or mitigated.

Dr. Andrei Tchernitchin, Universidad de Chile (University of Chile), Chile, briefly reviewed some of the medical consequences of exposure to lead, citing original research performed by the School of Medicine at the University of Chile. He then discussed the Medical College's decision to screen the populations in Antofagasta and Arica for lead poisoning and their subsequent efforts to bring the extent of the problem they discovered to the attention of government authorities. This process took over a year and finally required massive press attention before the government acted decisively.

CONAMA is seeking to forestall similar incidents from occurring in the future and to identify analogous situations that may currently exist to address them before they reach crisis stage.

Tchernitchin and his colleagues estimate that in urban areas such as Santiago, approximately 30% of lead exposure results from deteriorating lead-based paint in buildings and offices; 60% can be attributed to

the continued use of leaded gasoline; and the remaining 10% results from a variety of localized sources, primarily industrial. With these estimates in hand, they decided to focus on banning the continued sale of paint containing lead because the relative cost of reformulating paints is low. They succeeded in convincing the government of the wisdom of this course of action, and as of September 1998 all paint sold in Chile must contain no more than trace amounts of lead.

Returning to the situation in Antofagasta and Arica, Tchernitchin expressed concern about the fate of the children who had been exposed to high levels of lead for extended periods of time. He predicted that many of them would suffer from severe learning difficulties and would struggle with even the

most basic subjects in school. He pointedly asked what the government planned to do to help the children and their families cope with these problems.

Finally, because the unloading and storage facility for the lead ore in Antofagasta has been relocated, he expressed great confidence that the situation there will greatly improve. On the other hand, the citizens of Arica have not benefited from a similarly decisive and swift response from the government - on the contrary, the toxic waste remains open to the elements and still represents a source of wind-borne contamination.

Bernadita Araya, Executive Director of Corporación Servicio Paz y Justicia (SERPAJ) - Arica (The Public Service Corporation for Peace and Justice of Arica), Chile, explained that her organization, the Arica-based affiliate of a national NGO, was mainly focused on the promotion of human rights and conflict

resolution. The organization's current involvement with the contamination and toxic waste dump in the city grew out of an environmental dispute resolution project that SERPAJ participated in last year. As part of this project, SERPAJ proposed an environmental education initiative for the residents of the city that would focus on designing a truly innovative participatory approach grounded in the reality of a specific, local, environmental challenge. One of the key aspects of this approach was the creation of an "ecomap" with members of the affected community to make them acutely aware of the signals of a degraded environment that they were noticing but had not truly paid attention to or understood. This diagnostic exercise is the keystone to SERPAJ's approach.

The traditional, detached approach typically employed by the government was inadequate in Arica because it failed to incorporate or acknowledge the communal and spiritual traditions of indigenous communities.

After describing in some detail how this diagnostic ecomap was prepared and subsequently used as an education and advocacy tool, Araya discussed SERPAJ's efforts to engage key governmental authorities on the issue and promote effective action to address the dangers being faced by the community. To accomplish this, they deemed it necessary to arrange for independent assays of the level and nature of the contamination. Working with a local university, SERPAJ incorporated the results of the two assays into a study that presented evidence of potentially hazardous levels of lead, cadmium and arsenic in public spaces and private residences in the area and made a number of recommendations for address-

ing the situation. She described her distress at the injustice of the situation, that the residents of the neighborhood in question not only must deal with crushing poverty, but must endure the risks and consequences of living in a poisoned environment.

Araya finished her remarks by stressing that the traditional, detached approach typically employed by the government when addressing environmental degradation and contamination were inadequate in situations like the one in Arica because they failed to incorporate or acknowledge the communal and spiritual traditions of indigenous communities.

Dr. Manuel Zamorano, Director of the Antofagasta Servicio de Salud (Health Service), Chile, began by pointing out that the Servicio de Salud is charged with enforcing the standards set by the relevant authorities in the central government, regardless of what their own personal judgment should be. That said, Zamorano believes that agents in the field should continually provide feedback and information as to the real world adequacy

of these standards to insure their continued relevance and appropriateness.

By way of background and to help explain the Servicio de Salud's initial lack of awareness of the lead problem, Zamorano recounted some of the acute medical problems faced by the population of Antofagasta due to elevated levels of arsenic, extreme solar radiation, and high incidences of various types of cancer. In addition, the Servicio de Salud did not have access to information or studies that examine the consequences and risks of low-level lead exposure.

In response to the high levels of lead that families living close to the old unloading/temporary storage facility are being exposed to, the Service has implemented an ongoing screening program. They have also striven to include a control population, which is located several kilometers from the old facility, as part of this program. Their initial findings support the common sense supposition that children living far away from the source of lead have blood lead levels below 10 µg/dl, while those living close to the facility are much more likely to have elevated blood lead levels.

The Service has formed a multidisciplinary group of medical professionals to monitor the health and development of children who have suffered excessive exposure to lead. The few children who are suffering more acute symptoms will receive particular attention as part of this coordinated response.

In addition to the population-focused studies, the Service has also spearheaded an environmental study of the affected areas and has discovered significant contamination throughout the neighborhoods down-slope of the old unloading center. Some of the streets in these areas are unpaved and an environmental analysis has found significant lead soil contamination to the depth of 10 centimeters.

Dr. Gamboa, Chief of Planning and Studies for the Environmental Health Division of the Ministerio de Salud (Health Ministry), Chile, focused on the situation in Arica and how the central Ministry has supported the Servicio de Salud of the city in responding to the current crisis. Gamboa pointed out that the city of Arica actually grew to encompass the site in question – in 1984 when the waste was deposited, the site was well outside the city limits and isolated from its inhabitants. By the early 1990's, however, the population had increased until a neighborhood had formed literally around the site. Though climatic conditions such as extreme aridity and high winds represent a potential risk for contamination, the mineral deposits are much coarser than in Antofagasta, making the airborne exposure risk somewhat less.

The government has completed an environmental impact which concluded that the waste represents a significant risk to the population and must be removed and the site remediated. The government has been monitoring levels of lead and arsenic in the blood of nearby populations during the removal of the waste, and has taken all reasonable precautions to limit further contamination, including the use of covered trucks and the frequent dousing of the disturbed waste with water. The waste is being relocated to a site, three kilometers from the original location. This site was selected by a local committee of experts and approved by the governor.

In addition, an environmental study similar to the one described by Zamorano was recently conducted to determine the extent of contamination in the areas adjacent to the original site. Though the results of this study are not yet available, they should provide crucial information regarding the possibility of a continuing threat to the population and will form the basis for further action on the part of the government.

G. Preventing Lead Poisoning in the Workforce Panel

Dr. Alejandro Morales, Medical Manager of Occupational Medicine, Mutual de Seguridad, Chile, gave a brief history of occupational medicine and proceeded to discuss the statutory framework that governed occupational safety and health, including lead exposure, in Chile. Mutual de Seguridad is a non-profit private organization legally charged with providing safety and medical benefits prescribed by law.

The Chilean occupational health and safety system has many innovative aspects. The law governing occupational safety and health is administered by the government, but is implemented primarily through a public-private partnership. In this case, the partnership is between the Servicio de Salud and Mutual de Seguridad, a non-governmental institution.

One section of the law specifies the types of exposures to chemical agents or environmental pollutants that qualify as occupational injuries. The standards for lead poisoning in workers, which are currently set at 50 µg/dl, were specified in a later decree. This standard is comparable to those of developed countries. However, the permissible limit for lead exposure, like any other permissible limit for exposure in the public health area is basically an estimate of likely tolerance, not a guarantee that no ill effects or sickness occur for a particular individual at a lower level of exposure. Setting occupational standards in this context is simply a probability exercise. Thus, a blood lead level beneath the permissible limit is not an indication of safety, but simply an indication that it is less likely that ill effects will occur. In this respect, all nations

who set permissible limits for toxins such as lead are engaged in a social calculus, balancing the social cost that a particular society is willing to absorb by exposing its citizens to a particular risk.

A program of prevention should focus on a variety of issues, including environmental controls and educating the workforce in an effort to change worker behavior to incorporate basic principles of industrial and environmental hygiene in everyday routines. These strategies must be complemented with an adequate health monitoring system that will provide timely and adequate information on the general health and well-being of the workforce.

Avogadro Aguilera, Industrial Hygienist, Mutual

de Seguridad, Chile, then gave his perspective on occupational health and safety in Chile. According to Aguilera, the worker protections contained in Chilean law are quite extensive and comprehensive. Moreover, the system is distinguished from most other around the world because it is largely private in nature.

Under its legal mandate, the Mutual de Seguridad covers more than a million workers, in a wide variety of professions, and who work in a broad spectrum of companies and businesses of varying sizes.

There are an incredible variety of jobs that expose workers to lead in some form in a modern industrial society, including any job that involves soldering, assaying gold, battery recycling, and, under current conditions in Chile, workers directly exposed to automotive fumes. These workers are often exposed to other hazardous substances, in addition to lead. Therefore, to design an adequate industrial hygiene program, employers must investigate potential sources of exposure to a vari-

A program of prevention should focus on a variety of issues, including environmental controls and educating the workforce.

ety of toxins, as well examine the particular characteristics of the workforce to determine whether there are any special vulnerabilities that must be taken into consideration. Sometimes, one worker sickens from exposure to a contaminant while another remains perfectly healthy due to idiosyncratic differences.

Most employers carry out the principles of industrial hygiene in the workplace only in response to regulatory or legal requirements. Such an approach can inhibit innovative thinking and result in missed opportunities for injury prevention and, by extension, missed opportunities for cost savings.

H. Panel on Best Practices in Lead Poisoning Prevention

Magda Lovei, Senior Economist in the World Bank's Environment Division, provided a brief summary of the current status of global efforts to phase out leaded gasoline, and drew on specific

examples from outside the region that may prove instructive to Latin American countries attempting to embark on or complete phase-out.

At present, although approximately 80% of the gasoline sold worldwide is unleaded, at least 24 countries have completely phased-out leaded gasoline. The relatively high percentage of unleaded gasoline sold can be explained by the fact that the United States and Japan, two of the largest consumers of gasoline, use only unleaded gasoline. The percentage of leaded gasoline sold in the rest of the world is therefore much higher. However, the number of countries moving completely to unleaded gasoline is growing steadily.

One example of a country that was able to phase out leaded gasoline rapidly is the Slovak Republic.

This was largely because of the refinery company's interest in upgrading its facilities in order to expand into the export market for combustibles. The government supported the phase-out effort with a taxation scheme that gave consumers an economic incentive to switch to unleaded gasoline, as well as a public awareness campaign to educate drivers about the reasons for the change. In Thailand, leaded gasoline phase-out was driven by public health concerns. Screening studies indicated an acute problem which received considerable attention in the media. The King of Thailand took a personal interest in the issue and assumed a leadership role in the process. This, combined with tax differentiation to support the phase-out, made rapid phase-out possible.

In El Salvador, the phase-out of leaded gasoline took only one year because the owners of the privately held refineries were flexible and responsive to the government's phase-out initiative.

In El Salvador, the phase-out of leaded gasoline took only one year because the owners of the privately held refineries were flexible and responsive to the government's phase-out initiative. Some of the key advantages

of such a rapid approach include: eliminating the need for a dual fuel delivery system; reducing the chances that misfueling will foul catalytic converters; and a dramatic drop in airborne lead and blood lead levels. Perhaps more telling was that the switch did not require any major refinery modifications.

A key lesson demonstrated by these cases is that, at least on the technical side, leaded gasoline phase-out is relatively simple to achieve given certain conditions. These conditions include: a government commitment to begin the process and implement necessary regulations; incentives on both the supply and demand sides; an effective mechanism for reaching consensus among key stakeholders; and a broad-based public awareness

and education campaign designed to support and facilitate phase-out efforts.

Jorge Oviedo, Director of the Urban Ecology Program of Fundación Natura (Nature Foundation), Ecuador, described the work of Fundación Natura, a non-governmental organization based in Quito, Ecuador. Fundación Natura has three main areas of focus for its work in Ecuador: 1) protecting the nation's biodiversity by strengthening and, in some cases, managing protected areas; 2) conserving natural resources; and 3) improving the urban environment.

After completing the original set of studies (described in the morning session) wherein Fundación Natura had discovered the extent of the lead contamination problem in Quito, the organization designed and instituted an advocacy campaign in an effort to make governmental authorities take decisive action to begin the phase-out of leaded gasoline.

One of the first steps in this campaign was the formation of a national organization called Parents Against Lead, whose initial membership consisted chiefly of the parents of children who had participated in the initial screening study.

This organization held several meetings and conferences as part of a sustained effort to inform the public about the gravity and consequences of lead contamination in the country and to attract media attention. They also focused particular attention on lobbying governmental officials and legislators about the issue. At the same time, Fundación Natura formed a national commission that was charged with developing a plan to phase out leaded gasoline. This commission included representatives from a broad range of institutions, including the Ministry of Energy, the refining sector, auto-

mobile manufacturers and importers, and the municipal authorities of Quito.

In 1995, as part of an effort to accelerate implementation of phase-out, the city of Quito issued a decree that banned the sale and use of leaded gasoline within the federal district of Quito, mandated catalytic converters for cars driven in the district, and ordered the introduction of a special filter to be attached to diesel pumps. Because unleaded gasoline was not available outside of Quito, presenting a likely risk of misfueling, the federal authorities eventually invalidated the catalytic converter requirement for the time being. The second phase of the organization's efforts involved securing the sale of unleaded gasoline in at least the country's four major metropolitan centers.

Unfortunately, these advocacy efforts came to the attention of Octel, a British company that is the primary manufacturer of leaded gasoline additives in the world. Octel began a persistent, aggressive,

and well-financed campaign to persuade officials and the general public that, especially for relatively poor countries like Ecuador, the continued use of leaded gasoline is a more rational choice. The arguments it employed were that an increase in aromatics was more of a health risk than continuing to pollute the environment with lead, and that modification of refineries, the introduction of catalytic converters, and the alternatives to lead for the oxygenation of gasoline were measures that are simply too costly.

According to Oviedo, this Octel campaign was quite effective in Ecuador where the arguments fell on sympathetic ears within the government. Despite a concerted effort to address and neutralize the propaganda campaign waged by Octel,

Fundación Natura designed and implemented an advocacy campaign in an effort to make governmental authorities take decisive action to begin the phase-out of leaded gasoline.

Fundación Natura still encounters resistance based on the faulty reasoning it spawned, especially the perception that the aromatics/lead trade-off is a necessary or difficult choice that must be made in the unleaded gasoline phase-out process. Fundación Natura has been active in the development of administrative standards and legislation related to the phase-out and finally succeeded, despite Octel's efforts, in enacting a law that required all gasoline sold in the country be lead-free by June, 1997.

Petroecuador missed this legal deadline and, as a result, the organization made use of a relatively new legal recourse provided by Ecuador's recently revised constitution, which guarantees the right to a safe and healthy environment, to file a lawsuit to compel the refining sector to comply. This lawsuit had been formally filed three weeks prior to the conference, and even though a judgment had yet to be rendered, there was evidence that it had catalyzed action on the part of Petroecuador. Oviedo shared his hope that Ecuador will phase out leaded gasoline completely by the end of the year.

Ximena Abogabir, Executive Director of Casa de la Paz, Chile, a prominent Chilean environmental NGO, noted that despite many previous efforts to bring the dangers of lead pollution to the attention of government authorities and the media, it took the crises in Antofagasta and Arica to motivate the government to act. She lamented that this pattern seems to be the norm when dealing with environmental degradation and mismanagement of natural resources. She expressed the hope that, now that the tragic situations that have developed in Antofagasta and Arica are firmly in the public eye, authorities will recognize that lead poison-

ing and pollution deserve to be on the public agenda.

Abogabir noted that, because of Chile's lack of attention to this issue in the past, her remarks would focus on lessons learned rather than best practices. One key lesson that the lead pollution problem has reinforced for her is the need to raise public awareness and understanding by introducing and implementing environmental education programs and allowing public access to relevant environmental information about government and private sector activities and actions.

The situation in Antofagasta is a clear example of how education or information could have pre-

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vented some of the more acute cases of lead exposure suffered by the families that resided near the temporary storage center for the lead ore. Owing to uncovered water tanks that sat atop many of the apartment buildings adjacent to the storage facility, the children living there were exposed to lead through

their drinking water as well as airborne dust. If the families had known about the dangers of lead, these water tanks could have been covered, thus preventing some of the most severe cases of exposure. In Arica, if the community had known that the piles of sand and dirt in its midst contained toxic chemicals or had there been any signs or other efforts to inform the population, then perhaps that tragedy could have been avoided or mitigated.

Another example related to the area of occupational safety and health, involves the many small, unlicensed battery recycling businesses located in and around Santiago. Studies have found blood levels among workers in these facilities ranging as high as 104 µg/dl and that the children of many

of these workers also suffered from elevated levels of lead in their blood. Such blood lead levels are outrageously high. Evidently these workers ate in contaminated areas and then went home in work clothes covered in contaminated dust to expose their families. Once again lack of awareness contributed to exposure in these situations.

Another example of a potentially serious source of exposure for urban and rural families is home gardens located too close to roads and highways. Abogabir expressed a concern that these families may think that, because the fruit and vegetables they grow in these gardens are less likely to have pesticide and herbicide residues, they are therefore safe and healthy.

These families must be educated about the possibility that these gardens are being grown in soil contaminated with lead and that they are likely to have lead residue on them.

Abogabir also expressed particular concern for the various potential sources of lead exposure in environments and situations where the presence of children is common. She cited playgrounds and parks, in particular, and also discussed the potential danger represented by painted wooden toys. Abogabir stated that because all of these things seemed harmless to the average adult, their danger of exposing children to lead was much greater. Once again educating parents is critical.

Abogabir also discussed the right that workers have to the results of blood tests their employers or the government conduct, citing various instances where individual workers have been unable to obtain results despite announcements there was a problem in that particular workforce with elevated blood lead levels.

She stressed that, in addition to a more general need for environmental education and curricula, the lead problems suffered in Arica and Antofagasta underscore the need for the Chilean government to develop effective right-to-know laws and procedures. She cited numerous examples of governmental authorities withholding information or failing to act on evidence of a problem. With respect to the situation in Antofagasta, she mentioned that as early as 1985 there had been evidence that the transport of lead through the city represented a severe risk to the public health. Indeed, in 1989, formal complaints were lodged with relevant governmental authorities. In both cases

no official response was forthcoming. In 1991, a study of blood lead levels of a sampling of children living near the original lead ore transshipment facility clearly demonstrated a high degree of exposure. Eventually, this led to a 1993 agreement to move the facility. Unfortunately, it has taken the current crises, five years later, to finally convince

the government to make an appropriate response.

Citing the preceding information as examples of an endemic pattern, Abogabir maintained that the government has a habit of withholding crucial information or denying or discounting the validity of data provided to it. Indeed, as little as two years ago, the federal government's highest ranking provincial official in the region indicated in official remarks that reports of lead poisoning in the population and public concerns associated with it were greatly exaggerated. Abogabir expressed her belief that, absent such a crisis, existing governmental procedures and practices fail to facilitate the kind of effective preventive approaches that are necessary to avoid similar crises in the near-term.

The lead problems suffered in Arica and Antofagasta underscore the need for the Chilean government to develop effective right-to-know laws and procedures.

She forcefully advocated development of effective legal and administrative mechanisms in the area of environmental protection as part of a more general effort to transform the culture of government in Chile by incorporating the principle of transparency and accountability.

Arturo Garcia-Costas, Conference Chair, Alliance To End Childhood Lead Poisoning, United States, focused on the strategic value and importance of information in efforts to prevent lead poisoning generally and promote the phase-out of leaded gasoline specifically. Building on themes touched on in Jorge Oviedo's and Ximena Abogabir's remarks, he presented potential elements of a comprehensive, multi-tiered awareness raising strategy and discussed the reasons behind each of the elements.

Garcia-Costas suggested that it would be optimal to divide the target audience into an appropriate number of broad categories such as governmental and non-governmental, then further divide these categories into a variety of sub-groups such as potential allies, key decision-makers, etc., and then tailor awareness-raising tactics and activities accordingly. He cited the efforts Fundación Natura made to reach out to the parents of the children they had tested as an example of how such targeted and tailored awareness-raising can contribute to the success of a broader advocacy campaign. He mentioned the value in cultivating and educating select members of the media through workshops and informal briefings as another tactic in such a campaign.

He also stressed the effectiveness of combining altruistic appeals about protecting the environment and children with cold, hard facts about the individual, economic benefits that would result if ve-

hicle owners began using unleaded gasoline. He said that highlighting the studies that have shown that the spark-plugs last three to six times longer and the exhaust system, including the muffler, lasts up to twice as long in a car using unleaded fuel could be particularly effective messages for cost-conscious consumers.

He contended that informed consumers will typically make the "right" choice as long as there is little or no economic cost and it accords with their personal belief systems and value structures. The key, then, is to eliminate price distortions such as higher taxes on unleaded gasoline and provide consumers accurate, understandable information

about the consequences of their choices. Garcia-Costas mentioned the example provided by Argentina's successful phase-out efforts, wherein the taxes were shifted to encourage consumers to purchase unleaded gasoline. The windfall from the small overall tax increase on consumers was used to offset some of the

costs associated with needed refinery modifications and upgrades.

Dr. Raúl Tanco, Director of Environmental Safety and Health for YPF, Argentina, was unable to attend the conference as originally planned, but submitted a paper. A summary of his paper is provided here because the experience of YPF Argentina, the national oil company, illustrates the benefits of phase-out from the perspective of the refinery sector.

According to Tanco, one of the primary reasons for phasing out leaded gasoline as quickly as possible is to enable the introduction of catalytic converters, which dramatically improves urban air quality. In addition to catalytic converters, phas-

The key is to eliminate price distortions such as higher taxes on unleaded gasoline and provide consumers with accurate, understandable information about the consequences of their choices.

ing out leaded gasoline allows the introduction into the market of more efficient cars, with modern and less polluting automobile engine technologies. With the rapid urbanization occurring across the developing world and the resulting degradation of air quality that typically accompanies this trend, nations must redouble efforts to phase out leaded gasoline.

In addition, Latin America and the Caribbean have a long history of exporting combustibles, especially to the United States. The demand for reformulated gasoline (a cleaner fuel) has provided export opportunities for Colombia, Argentina, and other countries that have taken advantage of the opportunity afforded by leaded gasoline phase-out to invest in upgrading refineries to produce reformulated gasoline.

Countries embarking on phase-out need to take into account the characteristics of its vehicle fleet. For example, if the majority of the vehicle fleet is not equipped with catalytic converters, it is crucial to determine the consequences and interactions that may result from different fuel specifications with respect to emissions of environmentally damaging pollutants (e.g., VOCs, NOx, and aromatics).

It is possible to develop fuels that have fewer contaminants, but investment in the modification and upgrading of refining processes is required. There are a number of processes that can be used to oxygenate fuels without resulting in an increase in other undesirable pollutants including alkalization, isomerization, and the use of other additives such as ethanol and MTBE. In short, increasing the benzene content of gasoline is not a necessary consequence of phasing out the use of leaded gaso-

line. Indeed, all gasoline, leaded and unleaded, contains benzene.

Tanco believes that the refining sector should be at the forefront of global efforts to phase out leaded gasoline because there are simply no technical or scientific reasons to justify its continued use and there is a broad spectrum of economically viable alternatives for achieving the desired level of octane in fuels.

Dr. Jorge Luis Varela, Manager of International Projects and Operations for the Science Applications International Corporation (SAIC), United States, stated that, as a Chilean, he was going to focus his remarks on the inadequacies of

One of the primary reasons for phasing out leaded gasoline as quickly as possible is to enable the introduction of catalytic converters, which dramatically improves urban air quality.

the current approaches to environmental regulation and management in his country. He warned that, in Chile, there is a tendency to try to compartmentalize a problem into neat, easily separated packages according to particular scientific and professional disciplines. He argued that solving most

environmental problems requires a holistic approach and cited the multidisciplinary nature of the conference audience as an example of a step in the right direction. Varela also recommended that conference participants seriously consider the holistic approach to lead poisoning prevention presented in the Alliance's *International Action Plan for Preventing Lead Poisoning*.

One of the things Varela considered most positive about this conference was its holistic nature in terms of the audience. This result and community involvement would have been impossible to achieve in any Latin American country just a few years ago. There is now an increasing environmental democratization process primarily revealed by the civil society involvement and local com-

munity pro-active participation in the environmental decision making process, including in policy initiatives, and in the legislative and regulatory phases. These processes are relevant to resolve crises such as those related to the population's lead exposure in Chile.

Still, however, there are in the Latin American region two major deterrents or obstacles for comprehensive community involvement in the sustainable development field. On the one hand, many governments remain reluctant to make available effective opportunities for meaningful participation (as the North-South Center of the University of Miami has expressed in a recent document). For centuries, Latin American countries (in the tradition inherited from continental Europe) have discussed and enacted legislation and made critical public decisions involving people's lives in total secrecy or at least with complete disregard to community participation. On the other hand, citizens in Latin American countries do not understand very

well that community involvement and active participation of civil society are not only a right, but a civic duty for their own benefit. The environmental arena, because it is a cutting edge area where life and death, property and its social inherent function, health, and public and private interest are all at stake, is serving as an experimental laboratory for doing things and addressing the real issues differently for the first time ever. Never before in this hemisphere has there been a more germane and felicitous time for cultivating authentic democratic values. The Alliance's conference and its audience is one more testimony of this.

According to Varela, the compartmentalized approach has resulted in a basic strategic inefficiency in how Chile confronts the environmental chal-

lenges it is facing. When the dialogue degenerates into engineers talking to engineers, doctors talking to doctors, and lawyers talking to lawyers, arriving at the most effective solution becomes unlikely and the problem is not sufficiently analyzed. Each of these disciplines and professions tends to examine a problem from a particular perspective. The nations that have begun to deal effectively with their domestic environmental problems are those in which there have been opportunities for scientific dialogues that were and are multi-disciplinary in nature. Varela cited the Environmental Law and Policy Network of the Americas, which is comprised of a 15-member panel of environmental experts (of which he is one) one of the best examples of an interdisciplinary and interscientific

dialogue to address environmental issues in the hemisphere. This Network is a direct result of the 1996 Bolivia Summit agreement, which charged the OAS with its creation. In addition to the OAS, the United Nations, the U.S. Agency for International Development, and the North-

South Center have instrumental in developing the Network.

Varela maintained that members of particular disciplines or professions have the unfortunate tendency to believe that their particular analytical viewpoint represents the primary truth of a matter, and that the solution to every environmental problem lies with their discipline. This is an error. We are not inclined in our dialogue to recognize and appreciate the contribution to the truth that each discipline of the scientific community can make. Thus, when we speak of an integrated plan, we must be sure to determine that this plan is not simply the product of a group of individuals of the same profession.

The fact remains that prevention is much less expensive than either remediation or reparation.

Varela has frequently heard it said that too often environmental protection and management is about improvisation as opposed to prevention, the focus of this conference. The fact remains that prevention is much less expensive than either remediation or reparation. As long as the basic understanding of the inherent values of prevention is lacking, environmental problems cannot be effectively or economically resolved. Varela believes that one of the most effective strategies for advancing prevention is multidisciplinary training programs.

What's more, as an environmental attorney, Varela does not subscribe to the often-repeated notion that Chilean environmental law is permissive. He contends that it is not the legal system, but ignorance, that results in permissiveness. Chile could accomplish much in the way of environmental protection with the laws that are currently on the books, but these laws are not adequately understood or applied. Moreover, international standards that should be applied domestically are inadequately known or considered. International standards are coming into being both as part of formal international conventions and as customary practices that begin to take on the nature of standards. Varela believes that Chile has an obligation to understand the implications of these developments and incorporate them accordingly into its domestic legal and regulatory system. Aggressive training programs on environmental issues for lawyers and judges would help in reaching that goal.

I. Closing Remarks

Roberto Belmar, Ministerio de Salud (Ministry of Health), Chile, concluded the meeting by pointing out that the spectrum of perspectives represented by the diversity of the audience, and presenters, and panelists had contributed to an extremely informative and sophisticated dialogue on a critical issue facing the hemisphere. He stressed the continuing need for multidisciplinary research efforts on the various environmental problems

plaguing the region, including atmospheric pollution, continued degradation of the fresh-water supply, exposure to heavy metals, and the continued use of pesticides and herbicides. He stressed that all of this was made even more urgent by the continuing urbanization of the population of the Americas – South America, for instance, is the most urban continent in the world, with three out of every five people living in a major urban center.

He stated that the conference had reaffirmed his sense that he must communicate accurate information and analyses both to the decision-makers above him in the governmental hierarchy and to the general public. He stressed that often divisions such as his also suffer from a deficit of information, because of a lack of basic resources such as field inspectors.

Belmar pointed out that the recent problems with cholera were in some ways a disguised blessing, because it caused the government to provide his office with more resources, which has in turn resulted in more information about the country's water quality in general. He has used these resources in an innovative program in which he uses volunteers from the community to collect samples and perform other basic environmental quality monitoring tasks in their geographic area. He believes that these kinds of programs are particularly promising because they engage members of

III. WORKSHOP SUMMARY

communities as active participants in protecting the environment in which they live and begin to eliminate the “parent-child” mind-set that currently characterizes the way governments and some citizens view environmental stewardship in Latin America.

Immediately following the conference, on Saturday, April 18, the Alliance held a *Hemispheric Policy Workshop of Technical Experts*. Attendees were asked to participate as technical experts in the discussions, rather than as official representatives of their organizations. This section summarizes the general consensus that was reached during the discussions and does not represent the opinion of any one individual or organization with which they are affiliated.

To provide background to participants, Carlos Jaramillo of OLADE, provided a more detailed explanation of the hemispheric effort to harmonize fuel specifications which the organization is spearheading than he had given during the conference on the previous day. The group then discussed how that hemispheric effort would have an impact on leaded gasoline phase-out.

As additional background, Maria Rapuano of the Alliance provided an overview of the Alliance’s *International Action Plan for Preventing Lead Poisoning*, which sets forth a framework for the actions that need to occur at all levels to reduce and eliminate lead poisoning. The *Action Plan* elaborates the specific strategies that should be carried out at the international, regional, national, and local levels to prevent lead poisoning, and the roles that should be played by nongovernmental and community-based organizations and the private sector. The recommendations are purposely general because the sources of lead vary from country to country and community to community. The *Action Plan* therefore offered a starting point for the

group to build on in the development of specific recommendations for hemisphere.

Workshop participants then agreed to try to develop recommendations for prevention lead poisoning in the hemisphere. As a first step, participants identified the relevant target audiences and types of organizations for which the recommendations could be tailored. They identified the following:

- Government agencies and bodies, including ministries, legislatures, and commissions;
- International organizations, such as the World Bank, the Organization of American States, and the Pan-American Health Organization;
- Non-governmental organizations, including advocacy groups, foundations, trade unions, and academic institutions;
- The private sector, including banks, lead-related industries, professional associations and consulting firms; and
- Local community groups and representatives.

The first substantive area in which the group decided to develop recommendations was the issue of access to and availability of accurate information or community “right-to-know,” which was defined by the group as: *the right of society to know the potential and harmful effects of the products being sold and the methods of preventing those effects*. The group also concluded that governments have a responsibility to implement whatever actions are necessary to guarantee that this right is fully realized by its consumers. After a broad-ranging discussion in which various perspectives and priorities were examined, participants articulated the following set of specific recommendations for implementing right-to-know:

- Manufacturers and importers should provide clear information to consumers about the potential or actual harmful effects of any product they introduce into the marketplace.
- Non-governmental organizations should cooperate with studies and investigations about product safety by disseminating results to and maintaining information for the general public.
- National governments should develop and implement right-to-know policies and practices, particularly with respect to activities or situations that could expose the general public to lead.
- International organizations should actively promote and support national right-to-know efforts.

The next thematic area that was discussed was the implications of the hemispheric effort to establish a Free Trade Area of the Americas and the potential for increasing awareness of the trade in lead-containing products that that initiative might provide. There was general discussion about the role of the World Trade Organization and the ongoing global debate on the relationships between free trade, environmental degradation, and sustainable development. Workshop participants concluded that more research and analysis needed to be done on the issue, but made the following initial recommendations:

- Governments should prohibit the export of products that are banned from sale within their domestic market because they contain lead or other toxic substances.
- Governments should prohibit and the private sector should discontinue trade in products that unnecessarily contain lead and other toxic substances.

- Governments and civil society should monitor the trade in lead-containing products to determine the potential or actual harm this trade represents to public health and the environment.

Finally, participants addressed the roles of norms and standards in lead poisoning prevention efforts. Recommendations included:

- Governments and international organizations should clarify and update lead-related standards to reflect current practice and scientific consensus.
- Government and international organizations should harmonize standards upward in favor of the most stringent scientifically defensible ones being used by governments or international organizations.
- Governments and international organizations should develop international and national guidelines that set forth appropriate responses to the spectrum of situations that may result when standards are violated. Such guidelines should be based on the best available scientific data and incorporate lessons learned and best practices.
- Governments and regional organizations should harmonize fuel specifications – including the phase out of leaded gasoline – throughout the hemisphere.
- Governments should review national standards governing the manufacture of products that contain lead in an effort to limit or eliminate the use of the metal in consumer products such as paint, ceramics, toys, and so forth.

IV. Appendix A: Conference Agenda

- Governments should institute national regulations for the disposal of lead-containing products and to govern commercial activities that may create lead exposure hazards.

8:00 -9:00 a.m.	Registration
9:10 - 9:15 a.m.	Welcome and Introduction of Co-Sponsors – Arturo Garcia-Costas, Alliance To End Childhood Lead Poisoning, USA
9:15 - 9:30 a.m.	Opening Remarks – Dr. Horst Otterstetter, Director of the Environment and Health Division, Pan American Health Organization
9:30 - 10:15 a.m.	Global Dimensions of Lead Poisoning: A Challenge to Sustainable Development – Maria Rapuano, Alliance To End Childhood Lead Poisoning, USA
10:15 - 11:15 a.m.	The Life Cycle of Lead as an Environmental Pollutant: The Case of Leaded Gasoline – Maria Rapuano
11:15 - 11:30 a.m.	Break
11:30 - 12:00 p.m.	Leaded Gasoline Phase-Out: The Case of Peru – Gregorio Neglia, Ministry of Transportation, Communications, Housing and Construction, Peru
12:00 - 1:15 p.m.	Leaded Gasoline Phase-Out in the Americas – Magda Lovei, World Bank; Robin Rosenberg, North-South Center, USA; Carlos Jaramillo, Latin American Energy Organization, Ecuador; Gregorio Neglia; and Jorge Oviedo, Fundación Natura, Ecuador Moderator: Maria Rapuano, Alliance To End Childhood Lead Poisoning, USA
1:15 - 2:30 p.m.	Lunch
2:30 - 4:00 p.m.	Lead Contamination in Antofagasta and Arica – Dr. Andrei Tchernitchin, University of Chile, Chile; Dr. Manuel Zamorano, Health Service - Antofagasta, Chile; Dr. Ruben Gamboa, Ministry of Health, Chile; Dr. Patricia Matus, National Commission on the Environment, Chile; and Bernadita Araya, Paz y Justicia, Chile Moderator: Jorge Lambeth, Science Applications International Corporation (SAIC), Chile
4:00 - 4:15 p.m.	Break

- 4:15 - 5:30 p.m. **Preventing Lead Poisoning in the Workforce** – Dr. Alejandro Morales, Mutual de Seguridad, Chile; and Avogadro Aguilera, Mutual de Seguridad, Chile
Moderator: Carlos Arroyo Barros, Mutual de Seguridad, Chile
- 5:30 - 6:30 p.m. **Best Practices in Lead Poisoning Prevention** – Ximena Abogabir, Casa de la Paz, Chile; Gregorio Neglia; Magda Lovei; Jorge Oviedo; and Arturo Garcia-Costas
Moderator: Dr. Jorge Luis Varela, SAIC, USA
- 6:30 - 6: 45 p.m. **Closing Remarks** – Dr. Roberto Belmar, Chief of the Division of Health and Environment, Ministry of Health, Chile