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A row of five orange silhouettes of children holding hands, positioned behind the main title text.

**International Conference on
Environmental Threats to
the Health of Children:
Hazards and Vulnerability**

Chulabhorn Research Centre
Bangkok, Thailand
3-7 March 2002

Final Conference Report

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Background

A growing number of diseases in children are linked to the unsafe environments in which they live, learn, play and grow. Children may be exposed, during periods of vulnerability, to high levels of pollutants in air, water, food and soil, and to chemicals present in household products and contaminated consumer goods. These problems are magnified in the developing countries where air pollution, lack of access to safe water and sanitation, misuse of chemicals, and other environmental risks are determinants of a large burden of disease in children.

The environment is a key factor in determining the healthy development of children, and the World Health Organization (WHO) recognizes that efforts should be made to enable countries to assess their environmental risks and establish appropriate prevention and monitoring mechanisms. The health and environment sectors should be able to exchange experience and knowledge, promote research, disseminate information, and inform the community on how to protect children from environmental threats.

A conference on "Environmental Threats to the Health of Children" was organized in Manila, Philippines, in April 2000 with the participation of WHO headquarters and the Western Pacific Regional Office. It recommended, among other actions, the organization of a larger conference in the Asia Pacific Region by the year 2002. The WHO Task Force on the Protection of Children's Environmental Health (CEH) followed up this recommendation.

On 27 September 2000, Her Royal Highness Professor Dr Princess Chulabhorn Mahidol visited WHO in Geneva, and the opportunity was taken to discuss the possibility of organizing a conference on Children's Environmental Health in Thailand. Scientific issues concerning children's environmental health were addressed. Reference was made to special hazards in children's environments, and to the effects of pesticides, lead exposure, mercury contamination, potential endocrine disruption, food contaminants, and other hazards.

In view of the new information available in the scientific domain, it was considered timely to address the latest knowledge on children's vulnerability at the international level, and to discuss potential actions to be taken. A science-oriented conference hosted by a well-recognized research institute would allow participants to focus on new research results, study methodologies, and capacity-building issues.

Her Royal Highness Professor Dr Princess Chulabhorn Mahidol kindly offered to host the conference at the Chulabhorn Research Institute in March 2002, the main theme being the specific vulnerability of children to environmental hazards.

The scope of the conference was largely regional and focused on Children's Environmental Health (CEH) issues which had a very high prevalence and health impact in the WHO South-East Asia and Western Pacific Regions. However, as similar environmental threats to children's health are present throughout the developing world, interested scientists and professionals from other Regions participated and benefited from attendance.

The participants included: (i) professionals from the health and environment sectors who are involved in the areas of training, research, and medical and social sciences that are related to children's environmental health; (ii) persons in the educational sector and/or those involved in community activities; (iii) representatives from governmental and nongovernmental organizations (NGOs) concerned about children's health; and (iv) a number of children and adolescents involved in environmentally-oriented school activities.

The expected outcome of the conference included a commitment to national and international activities in the area of CEH, a statement setting priorities for action, and the report of the conference presented here.

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COLLABORATORS

- United Nations Children's Fund (UNICEF)
- United Nations Environment Programme (UNEP)
- Water Supply and Sanitation Collaborative Council (WSSCC)
- International Programme on the Elimination of Child Labour (IPEC/ILO).

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Foreword

The ***International Conference on Environmental Threats to the Health of Children: Hazards and Vulnerability*** was a milestone in addressing a wide range of issues specific to health and environment. The five-day conference addressed new scientific data and research results on the special vulnerability of children to environmental hazards. The primary objectives were to:

- Address new scientific data and research results on children's vulnerability.
- Discuss how to improve the current health conditions of children.
- Increase the awareness of the health, education and environment sectors about CEH issues.
- Promote action on the protection of children's environmental health around the world.

The Bangkok Statement – a pledge to promote the protection of Children's Environmental Health – represents an accomplishment of the Conference. This will pave the way, and establish a basis for developing a more sustainable future for our children. It is a major contribution in promoting actions, and raising public awareness about the environmental threats affecting the health of children.

Healthy children are crucial to sustainable development. Protecting children from environmental hazards is one of WHO's priorities. Together we must work and find effective strategies to achieve our goal: providing a healthier environment for our children.

We count on everyone to promote and disseminate the Bangkok Statement and to act upon it. The time to translate knowledge into action is now.

Chulabhorn Research Institute

*WHO Task Force for the Protection
of Children's Environmental Health*

THE BANGKOK STATEMENT

A pledge to promote the protection of Children's Environmental Health

We, the undersigned scientists, doctors and public health professionals, educators, environmental health engineers, community workers and representatives from a number of international organizations, from governmental and nongovernmental organizations in South-East Asian and Western Pacific countries, have come together with colleagues from different parts of the world from 3 to 7 March 2002 in Bangkok, Thailand, to commit ourselves to work jointly towards the promotion and protection of children's health against environmental threats.

Worldwide, it is estimated that more than one-quarter of the global burden of disease (GBD) can be attributed to environmental risk factors. Over 40% of the environmental disease burden falls on children under 5 years of age, yet these constitute only 10% of the world population. The environmental burden of paediatric disease in Asia and the Pacific countries is not well recognized and needs to be quantified and addressed.

We recognize:

That a growing number of diseases in children have been linked to environmental exposures. These range from the traditional waterborne, foodborne and vector-borne diseases and acute respiratory infections to asthma, cancer, injuries, arsenicosis, fluorosis, certain birth defects and developmental disabilities.

That environmental exposures are increasing in many countries in the region; that new emerging risks are being identified; and that more and more children are being exposed to unsafe environments where they are conceived and born, where they live, learn, play, work and grow. Unique and permanent adverse health effects can occur when the embryo, fetus, newborn, child and adolescent (*collectively referred to as "children" from here onwards*) are exposed to environmental threats during early periods of special vulnerability.

That in developing countries the main environmental health problems affecting children are exacerbated by poverty, illiteracy and malnutrition, and include: indoor and outdoor air pollution, lack of access to safe water and sanitation, exposure to hazardous chemicals, accidents and injuries. Furthermore, as countries industrialize, children become exposed to toxicants commonly associated with the developed world, creating an additional environmental burden of disease. This deserves special attention from the industrialized and developing countries alike.

That environmental hazards arise both from anthropogenic and natural sources (e.g. plant toxins, fluoride, arsenic, radiations), which separately and in combination can cause serious harm to children.

That restoring and protecting the integrity of the life-sustaining systems of the earth are integral to ensuring children's environmental health now and in the future. Therefore, addressing global changes such as human population growth, land and energy use patterns, habitat destruction, biodiversity loss and climate change must be part of efforts to promote children's environmental health.

That despite the rising concern of the scientific community and the education and social sectors about environmental threats to children's health and development, progress has been slow and serious challenges still remain.

That the health, environment and education sectors must take concerted action at all levels (local, national, global), together with other sectors, in serious efforts to enable our countries to assess the nature and magnitude of the problem, identify the main environmental risks to children's health and establish culturally appropriate monitoring, mitigation and prevention strategies.

We affirm:

That the principle “*children are not little adults*” requires full recognition and a preventive approach. Children are uniquely vulnerable to the effects of many chemical, biological and physical agents. All children should be protected from injury, poisoning and hazards in the different environments where they are born, live, learn, play, develop and grow to become the adults of tomorrow and citizens in their own right.

That all children should have the right to safe, clean and supportive environments that ensure their survival, growth, development, healthy life and well-being. The recognition of this right is especially important as the world moves towards the adoption of sustainable development practices.

That it is the responsibility of community workers, local and national authorities and policy-makers, national and international organizations, and all professionals dealing with health, environment and education issues to ensure that actions are initiated, developed and sustained in all countries to promote the recognition, assessment and mitigation of physical, chemical and biological hazards, and also of social hazards that threaten children’s health and quality of life.

We commit ourselves:

To developing active and innovative national and international networks with colleagues, in partnership with governmental, nongovernmental and international organizations for the promotion and protection of children’s environmental health, and urge WHO to support our efforts in all areas, especially in the following four:

PROTECTION AND PREVENTION - To strengthen existing programmes and initiate new mechanisms to provide all children with access to clean water and air, adequate sanitation, safe food and appropriate shelter:

- Reduce or eliminate environmental causes and triggers of respiratory diseases and asthma , including exposure to indoor air pollution from the use of biomass fuels and environmental tobacco smoke.
- Reduce or eliminate exposure to toxic metals such as lead, mercury and arsenic, to fluoride, and to anthropogenic hazards such as toxic wastes, pesticides and persistent organic pollutants.
- Reduce or eliminate exposure to known and suspected anthropogenic carcinogens, neurotoxicants, developmental and reproductive toxicants, immunotoxicants and naturally occurring toxins.
- Reduce the incidence of diarrhoeal disease through increased access to safe water and sanitation and promotion of initiatives to improve food safety.
- Reduce the incidence of accidents, injuries and poisonings, as well as exposure to noise, radiation, microbiological and other factors by improving all environments where children spend time, in particular at home and at school.
- Commit to international efforts to avert or slow global environmental changes, and also take action to lessen the vulnerability of populations to the impact of such changes.

HEALTH CARE AND RESEARCH - To promote the recognition, assessment and study of environmental factors that have an impact on the health and development of children:

- Establish centres to address issues related to children’s environmental health.
- Develop and implement cooperative multidisciplinary research studies in association with centres of excellence, and promote the collection of harmonized data and their dissemination.

- Incorporate children's environmental health into the training for health care providers and other professionals, and promote the use of the environmental history.
- Seek financial and institutional support for research, data collection, education, intervention and prevention programmes.
- Develop risk assessment methods that take account of children as a special risk group.

EMPOWERMENT AND EDUCATION – To promote the education of children and parents about the importance of their physical environment and their participation in decisions that affect their lives, and to inform parents, teachers and caregivers and the community in general on the need and means to provide a safe, healthy and supportive environment to all children:

- Provide environmental health education through healthy schools and adult education initiatives.
- Incorporate lessons on health and the environment into all school curricula
- Empower children to identify potential risks and solutions.
- Impart environmental health expertise to educators, curriculum designers and school administrators.
- Create and disseminate to families and communities culturally relevant information about the special vulnerability of children to environmental threats and practical steps to protect children.
- Teach families and the community to identify environmental threats to their children, to adopt practices that will reduce risks of exposure and to work with local authorities and the private sector in developing prevention and intervention programmes.

ADVOCACY – To advocate and take action on the protection and promotion of children's environmental health at all levels, including political, administrative and community levels:

- Use lessons learned to prevent environmental illness in children, for example by promoting legislation for the removal of lead from all gasoline, paints, water pipes and ceramics, and for the provision of smoke-free environments in all public buildings.
- Sensitize decision-makers to the results of research studies and observations of community workers and primary health care providers that need to be accorded high priority to safeguard children's health.
- Promote environmental health policies that protect children.
- Raise the awareness of decision-makers and potential donors about known environmental threats to children's health and work with them and other stakeholders to allocate necessary resources to implement interventions.
- Work with the media to disseminate information on core children's environmental health issues and locally relevant environmental health problems and potential solutions.

For all those concerned about the environmental health of children, the time to translate knowledge into action is now.

Bangkok, 7 March 2002



Welcoming Remarks

On 3 March 2002, His Excellency Dr Vichit Sri-sa-an, Personal Representative of Professor Dr Her Royal Highness Princess Chulabhorn Mahidol opened the Conference in the presence of over three hundred participants from 35 countries and organizations. He made a statement on behalf of Professor Dr HRH Princess Chulabhorn. Professor Dr Jisnuson Svasti was appointed Master of Ceremony, and introduced Dr Linda Milan, Director, Building Healthy Communities & Populations, World Health Organization (WHO) Western Pacific Region (WPRO) who gave an opening statement. Dr Richard Helmer, Director, Protection for the Human Environment, WHO, presented a token of appreciation to Professor Dr Her Royal Highness Princess Chulabhorn for hosting the Conference at the Chulabhorn Research Institute. Statements of the welcoming session are in Annex I.

The opening ceremony concluded with a lively and colourful Thai classical dance performed by the children from the school of dance, Ministry of Culture.

Opening of Plenary Session

At the opening plenary meeting on Monday, 4 March 2002, statements were made by: Dr Richard Helmer, World Health Organization (WHO); Ms Martha Berger, US Environmental Protection Agency; Dr Jorge Luna, on behalf of the Regional Director, WHO/SEARO; and Dr Vanessa Tobin, United Nations International Children's Fund (UNICEF).

Dr William Suk, representative of the National Institute for Environmental Health Sciences (NIEHS), was nominated Honorary Chair by acclamation. Dr Mathuros Ruchirawat, Vice President of the Chulabhorn Research Institute, was nominated Honorary Vice-Chair by acclamation.

The opening presentation on the Protection of Children's Environmental Health: Status in Developing Countries was made by Dr Irma Makalinao (Philippines) and Dr Philip Landrigan (USA) made a presentation on the Special Vulnerabilities of Children. Statements and presentations from the opening plenary are given in Annex II.

Summary of Plenary Sessions

Plenary Session 1: Water, Food and Disease

The first plenary session on Monday 4th March 2002 was on "Water, Food and Disease". It was co-chaired by Dr Peter Spencer (USA) and Mr Chetphan Karnekeaw (Thailand).

Presentations and Speakers

Vector-borne Diseases in Children, Dr Sustriayu Nalim (Indonesia)
Water Supply Contamination and Sanitation Issues in Asian Countries, Dr Chongrak Polprasert (Thailand)
Arsenic and Fluoride in Drinking Water, Dr Baoshen Zheng (People's Republic of China. PRC)
Food Safety, Nutrition and Children's Health, Dr Xu Ying (PRC).

This session addressed a number of environmental health threats to children. While man-made chemical pollutants dominate concern in developed countries, pervasive infectious agents, poor nutrition and naturally occurring factors in food and water are generally of far greater public health concern in less-developed

countries. Dr Polprasert stated that 75% of the world's poor live in Asia, 1 in 3 Asians lacks a safe water supply and 1 in 2 has inadequate sanitation.

Water contaminants are biological (fecal coliform bacteria), chemical (lead, nitrates) and suspended solids. Pure drinking-water can markedly reduce morbidity and mortality from diarrhoeal and other diseases. Dr Zheng described the contamination of drinking-water by fluoride and/or arsenic, and the medical geography in China of the corresponding diseases, fluorosis (skeletal and/or dental) and arsenicosis. Fluoride exposure is primarily associated with drinking-water since food intake of fluorine is very low. Deep waters and indoor combustion of coal provide additional sources of exposure to these toxic elements. Although advances have been made, pockets of arsenic-associated Blackfoot disease and skin cancer still occur.

Dr Nalim discussed the enormous health burden on poor Indonesian children who lack clean water and sanitation, and who are additionally exposed to transmissible agents that cause malaria, dengue and filariasis. The situation should be remedied through increased health education and improved behaviours coupled with control of vector breeding. Schools are training children in grades 4 to 6 to learn disease prevention skills; these "little doctors" spread the word to their peers and parents. Urban areas urgently need to improve the quality of the water supply and of sanitation to reduce diarrhoeal and other diseases. Government can facilitate community involvement and the private sector in a cooperative tripartite arrangement.

Dr Xu Ying discussed the many sources of food contamination: pathogenic microbes, aflatoxin, antibiotics, pesticides, and persistent organic pollutants, among others. He emphasized the critical importance of developing strong food safety and food management regulations to prevent illness from these sources. Dr Spencer pointed out that 500 million people consume a cyanide-releasing plant (cassava) linked to neurological disorders and diabetes mellitus, with unknown effects on the developing brain.

Plenary session 2: Air, Climate and Disease

The second session was on "Air, Climate and Disease". It was co-chaired by Dr Ali Khan (WHO) and Dr Nigel Bruce (United Kingdom).

Presentations and speakers

Air Pollution and Children's Health, Dr Bimala Shresthra (Nepal)

Indoor Air Pollution and Children's Health, Dr Karpala Balakrishnan (India)

Asthma and Upper Respiratory Diseases: Role of the Environment and Lifestyles, Dr Peter Sly (Australia)

Global Environmental Change and Children's Environmental Health, Dr Tony McMichael (Australia)

Dr Shresthra gave an overview on the effects of air pollution, followed by a report of problems of urban air pollution in Kathmandu valley, and the effects of indoor air pollution in rural areas. The potential health impact of secondary air pollutants, such as ozone, was discussed. No studies have yet been carried out on the effects of specific pollutants in Kathmandu, though these are the kinds of studies that would be useful in helping to make out a case for action to politicians.

The example of action on fuel in India was mentioned, and questions were raised about such action in Nepal, including action on 2-stroke engines. Although unleaded fuel is available, its use is restricted to about 1% (of users), as resources to convert vehicles are not available. Similarly, it has not yet been possible to deal with the problems of pollution from 2-stroke engines.

The co-chairs stressed that it would be useful to recommend (if this is not already being done) a systematic assessment of plans, progress, and barriers in addressing the sources of air pollution in the cities of less privileged countries, which, like Nepal, have not been able to successfully implement such policies.

Dr Balakrishnan gave an overview of the extent of indoor air pollution exposure, health impacts, methods and estimates of the burden of disease globally and in India. Fuel use in India, factors influencing exposure,

and barriers to use of cleaner fuels were described. Key messages were the extent of the problem globally, and the very substantial health burden – the majority of which arises from ARI in children. The discussions were centred on the time of exposure which is a critical issue, and on the potential for reducing this through raised awareness about risks. It was noted that detailed study of the patterns and times of exposure was only given importance recently, and although reduction of exposure of some family members may be possible (not so easy for the cook), this is an area that now needs to be assessed.

Dr Peter Sly gave a comprehensive and informative account of the development and triggering of asthma, and the roles of infection and environmental factors in these processes. The discussion covered issues such as the increased susceptibility of children of young mothers to asthma (whose systems are still in development) and factors responsible for the marked and widespread increase in the incidence of asthma. This appeared to be the result of ‘Westernization’ rather than urbanization per se. The most potent stimulus may probably be microbial, in particular alteration in the bowel flora due to diet/processed foods/use of antibiotics. This results in interference with the development of the immune system. Low-dose environmental exposures play a part in this, whereas higher levels experienced in poorer countries and settings (while deleterious to health in other ways) do not have the same effect. The process is complex and requires further study.

Dr McMichael gave a presentation on climate change covering: direct effects (e.g. increased UV radiation, temperature extremes, weather disasters), ecological changes (e.g. infectious diseases such as malaria, disrupted food production), and demographic displacement and social disruption (sea level rise, increased incidence of infectious disease).

The key messages included (a) the uncertainty about, yet importance of, this emerging topic, and (b) many of the impacts that do not specifically affect children, but may have an adverse effect on the most vulnerable ones (e.g. through lack of food supply/malnutrition, when children can be expected to be more vulnerable/at risk).

Plenary Session 3: Injuries, Poisonings and Radiation

The third plenary session was entitled “Injuries, Poisonings and Radiation”. It was co-chaired by Dr Nerida Smith (New Zealand) and Dr Michael Firestone (USA).

Presentations and speakers

Update: Global Implications of Childhood Poisonings, Dr Alan Woolf (USA)

Injuries and Accidents in Children, Dr Myint Myint Thein (Singapore)

Ultraviolet and other Radiations Affecting Children, Dr Colin Roy (Australia)

Dr Firestone provided a short introduction touching upon major poisoning problems in the United States, such as lead, methyl mercury, carbon monoxide, and pesticides – especially organophosphates exposure, as well as UV radiation and skin cancer.

Dr Alan Woolf (Harvard Medical School & American Association of Poison Control Centers) focused attention on the global implications of childhood poisonings, especially in terms of poisonings which occur in and around the home. He cited statistics demonstrating that 67% of poisonings occur in children. He highlighted the “golden triangle” of agent, host, and environment, discussed the changing role of poison control centres worldwide, and provided some perspective on their costs and benefits. Important roles of poison control centres included first aid, surveillance of trends, and development of preventive strategies.

Dr Myint Myint Thein (National Safety Council of Singapore) discussed Injuries and Accidents in Children. Dr Thein cited WHO data (1999) showing that almost 16,000 people around the world die from injuries every day. Children are a high-risk group for injuries – in fact, injuries are in the top four leading causes of death. She discussed the scarcity of morbidity data for developing countries. Injury prevention requires a multi-prong approach of safe environment, safe design, law enforcement and education, as well as involvement of different disciplines.

Dr Colin Roy (Australian Radiation Protection and Nuclear Safety Agency) closed the session with a talk about Ultraviolet and Other Radiations Affecting Children. He cited studies suggesting increased vulnerability of children. After describing different types of radiation, Dr Roy focused on the scientific underpinnings linking ionizing radiation and cancer, solar UV radiation and skin cancer, and magnetic fields associated with power frequencies and leukaemia. Finally, the difficulties in communicating about environmental health issues associated with radiation were discussed.

Plenary Session 4: Developmental Disorders

The session was dedicated to “Developmental Disorders”. It was co-chaired by Dr Nguyen Thi Hong Tu (Viet Nam) and Dr Bob Sonawane (USA).

Presentations and speakers

Overview and Scope of the Problem: Reproductive, Immune and Respiratory Development, Dr David Carpenter (USA)

Neurobehavioural Effects of Environmental Agents, Dr Prahlad Kishor (India)

Persistent Organic Pollutants and Endocrine Disruptors, Dr Terri Damstra (WHO)

Environmental Exposures and Childhood Cancer, Dr Xiao Ou Shu, USA

Dr Bob Sonawane (U.S. Environmental Protection Agency), Co-chair, made a brief presentation focusing on “Children Are Not Just Little Adults”. Children from the fetal stage through adolescence are in a dynamic state of growth as their immature nervous, respiratory, reproductive, and immune systems develop. They are more vulnerable to permanent and irreversible damage from toxicants than adults. He stressed that studies of the impact of exposure make clear that not just the degree and route of exposure, but also the timing of exposure during prenatal and postnatal development affects the response. He made several references to chemical agents that are known to and/or potentially may cause developmental disorders in children, such as lead, mercury, PCBs, dioxins and dioxin-like compounds, and certain pesticides.

Dr Sonawane described the extent of the problem as follows. Overall, approximately half of initial pregnancies do not result in the birth of a healthy normal child. Developmental abnormalities are extremely common: 1 in 33 babies is born with major birth defects, and minor structural anomalies are identified in 14–22% of live-born infants. Further, functional deficits are thought to occur in approximately 5% of children. He stressed that we know very little about the causes and role of environmental agents in the overall etiology of developmental disorders (birth defects). It is estimated that 3–5% of all birth defects may be due to some type of gene-environment interaction. Most of the environmental chemicals have not been tested for developmental toxicity. A summary of several databases has listed 900 agents as known animal developmental toxicants, and approximately 50 of these agents have sufficient human exposure information to be listed as known human developmental toxicants.

Dr David Carpenter (Albany Medical College, Albany, New York) presented the general overview of the problem and described the known or potential causes of developmental disorders in children. His presentation primarily focused on polychlorinated biphenyls, methyl mercury, dioxins and lead. He emphasized that environmental contaminants are known to cause decrements in intelligence, and promote abnormal and antisocial behaviour in children and some are known to disrupt the endocrine system, especially when their exposure occurs during fetal development or in early life, resulting in permanent disabilities.

Dr Prahlad Seth (Industrial Toxicology Research Centre, Lucknow, India) presented an overview of Neurobehavioral Effects of Environmental Agents: Vulnerability of the Developing Brain. He reviewed the basic neurodevelopmental processes, identified critical periods of susceptibility, and the effects of several classes of chemicals such as pesticides, heavy metals and PCBs. He presented scientific evidence linking chemical exposure during development in experimental animals and humans to several adverse neurodevelopmental outcomes including diseases of the aged individuals, such as symptoms similar to

Parkinson's disease (carbamate pesticides, manganese), Alzheimer's dementia (aluminium), Wilson's disease (copper), and neuro-behavioural effects (lead, mercury and PCBs). He emphasized that the genetic and nutritional factors modify the susceptibility of developing individuals.

Dr Terri Damstra (WHO-IPCS Research, Triangle Park, North Carolina, USA) made a presentation on Persistent Effects of Certain Organic Pollutants and Endocrine Disrupting Chemicals (EDCs) on the Health of Children. She stressed that many persistent organic pollutants (POPs) may have an adverse health impact, particularly during fetal, neonatal, and childhood development. She also summarized the current scientific data on health effects due to exposure to POPs and EDCs.

Dr Xiao Ou Shn (Vanderbilt University, Nashville, Tennessee, USA) spoke on Environmental Exposures and Childhood Cancer: Challenges and Opportunities. He presented statistics on the most commonly diagnosed childhood cancers in North America and Europe, and in some Asian countries. He reported that in African Americans, lymphomas are the common malignancies and inherited genetic defects account for less than 5% of all childhood cancers. He claimed that the vast majority of childhood cancers are presumably caused by environmental factors and their interaction with genetic susceptibility factors. He proposed that biomarkers of exposure and genetic susceptibility in disease-exposure assessment will advance childhood cancer research. He also urged a multidisciplinary approach and international collaboration to investigate the etiology of childhood cancers.

Dr Mohmood Khwaja (Sustainable Development, Islamabad, Pakistan) presented an overview of Effects of Lead on the Development of Children and discussed studies conducted in Pakistan on blood lead levels of 900 healthy schoolchildren (boys and girls) in Karachi, Peshawar, Rawalpindi and Lahore. The children in the study were below 15 years of age and belonged to lower income families. The overall mean of blood lead levels in three cities were (in microg/dl) 22.8 ± 3.30 , 19.00 ± 6.48 and 2.30 ± 0.19 (rural site). Children with dietary deficiencies were more susceptible to lead poisoning according to the 1998 population census of Pakistan. He estimated that 55 million children are below the age of 15 years, thus presenting a high-risk population to lead exposure resulting from leaded petrol use and increasing road traffic in the country. The reported lead (microg/cubic centimeter) in ambient air and dusts falling on some sites were: Karachi (1980-81) 0.13 – 0.24; Peshawar (1994-95) 0.21 – 0.79; Lahore (1993-94) 0.15 – 8.36 and (1999-2000) 0.89 – 7.85; and Rawalpindi (1999-2000) 0.71 – 10.00, indicating the very alarming increase and high levels of ambient air lead. Dr Khwaja also discussed the National Environment Action Plan, with special reference to a lead phase-out programme to provide clean fuel in the country.

Dr Theng Lee Chong (Center of Environmental Technology and Natural Resources Management, Malaysia) spoke on Scavenging Activities at Landfill Sites – A Quantitative Health Risk Assessment. He noted that full-time scavengers at landfill sites are mostly children in most of the developing countries. For example, in Jakarta (Indonesia) at least 200,000 children are scavenging for a living. The existing landfill sites in developing countries are dumps without any proper management and safety measures. He presented a case study on health risk assessment of child scavengers of different age groups at an existing landfill site in Kuala Lumpur (Malaysia).

Plenary Session 5: Towards the Protection of CEH

The session entitled "Towards the Protection of Children's Environmental Health" was co-chaired by Dr Lilian Corra (Argentina) and Ms Jing Jing Qian (UNICEF).

Presentations and speakers

Environmental Burden of Disease: Indicators and Information Needs, Dr David Briggs (UK)

Tools for the Practitioner: Taking the Environmental History of Children, Dr Sophie Balk (USA)

At this session, participants heard two presentations – on CEH indicators development and on environmental health history-taking. Both presentations illustrated potentially very useful tools for monitoring and promoting children's environmental health.

Dr David Briggs presented a framework of CEH indicators, which aims to express the link between the environment and health in a form that facilitates interpretation for effective decision-making. Like all other forms of information, the indicators depend on the way in which they are designed and the purpose for which they were built. Simple, one-to-one causal relationships do not usually exist between environmental risk factors and a health problem, thus posing a unique challenge to CEH indicators development. This challenge was clearly illustrated by Dr Briggs and well appreciated by the participants. Based on his ten-year study of CEH indicators, Dr Briggs proposed a matrix of CEH indicators, whose structure is based on layered environments of children and the so-called driving-force exposure-effect-intervention system. Participants were encouraged to give their comments on the framework through email communication with Dr Briggs.

Dr Sophie Balk's presentation offered a useful tool to medical practitioners while seeing patients. She discussed in much detail how paediatric clinicians can integrate questions about the child's environment into their health services. A number of interesting examples were given, which showed how easily the environmental cause of an illness can be overlooked, resulting in less effective treatment. The presentation then suggested generic areas of questioning for obtaining information on the child patient's physical environment and possible exposures to pollutants. The presentation was well received and participants did not raise major questions.

Being the last plenary, this session also contained two panel sub-sessions that wrapped up the working groups' recommendations and discussed partnership building, respectively. Summaries of these two panels are given separately.

Plenary Summary: Round Table

A round table on "Building Partnerships: Research, Capacity-Building and Interventions" took place with the participation of a number of NGOs and national and international scientific paediatric associations. The round table was co-chaired by Ms Joy E. Carlson (USA) and Dr Irma Makalinao (Philippines).

Coordinators: Dr Joy E. Carlson and Dr Irma Makalinao

Presenters: Dr Ruth Etzel, Dr Rahmat Awang, Dr Vanich Vanapruks, Dr Peter van den Hazel

Children's environmental health (CEH) research has implications for many sectors and supports and dictates best practices in: health care and public health; child development issues; individual and family lifestyles; manufacturing; economics; urban and rural planning; transportation; and architecture, to name a few. CEH research informs the development of public policy. For the first time, there is a significant body of research data available on CEH. How do we translate that information and knowledge to people who can use it? How can we begin to work with sectors within and outside of the health and research communities? One way is to build and engage in partnerships, networks, and coalitions. Four examples follow.

The American Academy of Pediatrics, which represents the 60,000 paediatricians in the USA, works with a variety of sectors to further the issue of child health. They work closely with policy-makers in Washington, DC, as well as with policy-makers at the state and regional levels to advocate child protection policies. Educating policy-makers requires scientists and physicians to learn to speak another "language" in order to communicate with policy-makers who often view the issues through a different framework. Making information work for people is also another goal and to that end the Academy has published a primer or handbook on CEH for paediatricians. Known as "The Green Book", it is now being revised for relevancy to both developing and industrialized countries and is being translated into several languages for use throughout the world. The Academy also partners with international organizations such as the International Pediatric Association and the WHO which recently held an air pollution conference in Beijing, out of which came the "Statement of Beijing" outlining specific commitments to governments in reducing air pollution levels.

The Asia Pacific Association of Medical Toxicology (APAMT) is a consortium of the poison control centres in the Asia Pacific region. Many of the poison control centres are expanding their scope and beginning to incorporate CEH issues. The APAMT has sections on research, training, and service. They have just started a special interest group on children's environmental health. This section plans to identify the people and expertise within the region, coordinate information and experience between the centres, and help direct the APAMT to support the goals and objectives of protecting children from environmental threats. A Website is under construction that will provide updates and tutorials, highlight activities and research (pesticides, metals, biological and environmental monitoring, etc.), provide a calendar of events, and have hyperlinks to many other organizations and resources. Additionally, plans are underway for training and collaboration with other organizations such as universities, Ministries of Health, and NGOs such as the Pesticide Asia Network. They hope to continue to incorporate CEH issues in all meetings, to increase training and research, and to advocate protective policies and legislation.

The Pediatric Society of Thailand has a variety of programmes and collaborations underway and in development. The Society cooperates with other organizations such as the Ministry of the Interior on school bus accidents and the Ministry of Public Health on childhood lead poisoning. They have also worked with drug companies looking at the issue of genetically modified organisms and contaminants. Policy Statements on safety and the environment are developed and issued when appropriate. The Society offers training and education to physicians, provides care for children, and collects data. The strategies of the Sub-Committee on Accidents and Poisonings include: strengthening team work, increasing studies and research, updating training, and educating the public.

The International Network on Child Health Environment and Safety (INCHES) shared some lessons in starting a network. Key points included: engage all the stakeholders including consumers and children; make good use of students and interns; set up an office and have a physical presence; ensure that you employ a variety of fundraising strategies; determine what type of organization/network you want to create — Is it an open network or membership? Is it national, regional, local, or international in scope? — and don't get discouraged! CEH is a key area of concern with the public and is quite popular with the media right now. Make good use of both sectors.

There was limited time for general discussion, but several participants shared their experiences in developing partnerships and added additional strategies and concerns.

Summary of Focus Sessions

Eleven Focus Sessions took place during the Conference. Six were held simultaneously in the afternoon on Monday 4 March, and five were held simultaneously on Wednesday 6 March. The purpose of the Focus Sessions was to review existing scientific data, new knowledge, and potential interventions in different areas. Two co-chairs and a rapporteur were nominated for each session. Each co-chair gave a state-of-the-art background presentation on the general topic. These were followed by 3 to 5 short presentations by participants. Participants were able to discuss specific environmental health issues.

Dr Kathy Shea (USA) was coordinator for all the focus sessions.

Focus sessions held on Monday 4 March 2002 were:

1. Environmental Tobacco Smoke: a Global Epidemic
2. Hazardous Waste and Scavenging in Open Dumps
3. Health Benefits of Water Sector Interventions
4. Lead Revisited
5. Pesticides and Persistent Organic Pollutants
6. Air Pollution

Focus Sessions held on Wednesday 6 March 2002:

7. Environmental Exposures and Development
8. Hazardous Exposures at Home and in the Workplace
9. Mercury: Exposure and Health Effects
10. Children's Environmental Health: Policy Issues
11. Asthma and Immune Diseases

Summary presentations of each Focus Session, as delivered by the rapporteur, can be found in Annex III.

Summary of Poster Sessions

On 4 and 6 March 2002, poster presentations were held on issues relating to Children's Environmental Health.



Poster competition on Children's Environmental Health

Fifty-three scientific posters and numerous children's drawings were presented, representing authors from 14 different countries. The posters were exhibited for the whole duration of the conference. Poster Sessions were set up at three specified times during the conference for participants to meet the authors and encourage discussions about the scientific data presented. The presentations stressed specific environmental hazards and their relationship with childhood illnesses, highlighting the special vulnerability of children and illustrating ongoing successful interventions as well as possible future directions. The poster presentations covered the following areas of concern: air quality and asthma, water quality and sanitation, fluorosis, mercury

and lead pollution, waste treatment, childhood cancer, malaria, radiation, noise, accidents and injuries, community initiatives. The children's posters originated from a poster-drawing competition between 206 schools in India which was designed to promote knowledge and to raise the awareness about health and the environment both among school students and within their communities. Abstracts of all poster presentations can be found in the Conference Booklet, Final Version www.who.int/phe/ceh

Working Group on Indicators

The Task Force for the Protection of Children's Environmental Health (CEH) is in the process of developing CEH indicators. These will provide a measure that relates a health outcome in a child (health outcome indicator) to exposure to an environmental hazard (exposure indicator). All chosen indicators should be of relevance to the decision-maker, and directly or indirectly amenable to control (policy/intervention indicator). The current work is based on the development of a framework and methodologies for environmental health indicators in the Department of Protection of the Human Environment (WHO, Geneva, 1999), and on the discussions during several interregional consultations on children's environmental health

A selected number of experts who attended the Bangkok Conference took the opportunity to finalize the work on CEH indicators which the Task Force started nearly a year ago. The meeting was held from 2 p.m. to 5 p.m. on 6 March 2002 in parallel to the Focus Sessions. The objectives were: (i) to define and recommend a core set of CEH indicators for worldwide use, and (ii) to provide clear guidance for the use of CEH indicators by Member States and international agencies.

Field Trip



Participants at Ban Saladang Community Village



Students explaining activities to participants

On Tuesday 5 March 2002, the World Health Organization, the Ministry of Health and the Bureau of Environmental Health, Thailand, organized a field trip to the Kanaratbamrung Pathum Thani Health Promoting School and to Ban Saladang Ecological Village. Over 100 participants were able to visit the school and assess the environmental education and protection activities developed by the students (e.g. promotion of artisanal activities with local products, water quality monitoring of the Chao Phraya river). During the visit to the village, the participants were able to see the community's management of water and waste. These visits were extremely useful, and emphasized the importance of the health of the children and their families while demonstrating that actions were possible at the community level.

Closing Ceremony

The final plenary session was held on Thursday 7 March 2002. Dr Richard Helmer chaired the session where concluding statements were made on the highlights of plenary sessions by Dr Jenny Pronczuk, WHO, and the highlights of poster sessions by Philip Landrigan, USA.

At the same meeting, the Conference adopted the Bangkok Statement — a pledge to promote the protection of CEH. The Bangkok Statement will enable participants to motivate decision-makers, inform colleagues and take action in the area of Children's Environmental Health. (The text of the Bangkok Statement can be found on page 4.)

The Conference closing statements were made by Dr Mathuros Ruchirawat, Vice-Chair of the Conference, and Dr Utom Rafei, Regional Director for South-East Asia, who closed the conference. Statements can be found in Annex IV.

The Conference concluded with a group of adolescents from the Pathum Thani school performing a lively role play and song entitled "The Gateway of Children's Environmental Health." The play highlighted a touching message and called for action and guidance by adults in protecting the environmental health of children.



Teachers, students and participants following the role play
"The Gateway of Children's Environmental Health"

*"Do not walk behind us because we cannot lead,
Do not walk ahead of us because we cannot catch up with you,
Please walk with us".*

A special message by students to the Conference participants.

ANNEXES

Annex I - Welcoming Remarks

Statement by Professor Dr Her Royal Highness Princess Chulabhorn Mahidol

Distinguished Colleagues, Ladies and Gentlemen!

I am very pleased to have the opportunity to open this international conference on the important subject of children and environmental health. It is with great pleasure that I welcome you all to the Chulabhorn Research Institute. The topic of the conference is of the greatest importance and I was therefore very happy to accept the invitation of the World Health Organization to co-organize this most important event. The conference provides a forum for the presentation and discussion of new approaches to the identification and assessment of environmental threats to children's health; and the presentations by eminent scientists will provide the springboard for discussions on how child environmental health concerns can be emphasized on the agendas of governments worldwide in order that the health of our children and of future generations can be safeguarded.

The initial founding and the aims of the Chulabhorn Research Institute derive from the tenets observed by my father His Majesty King Bhumibol in the royally initiated projects that he has carried out here in Thailand with the goal of promoting the quality of life through the application of science and technology in the judicious management and protection of the environment. At the institute, in addition to our scientific research programmes focusing on areas of environmental health, our training and awareness-raising activities are central to the same health concerns as this conference. In the regional training programmes which we organize both here in Bangkok and in other countries in South-East Asia, our purpose is capacity-building through human resource development in areas of scientific knowledge, most importantly environmental and industrial toxicology, and the application of this knowledge to environmental health concerns and to sustainable development and to safeguarding our quality of life.

The health of children and thus the health of future generations is crucial to our endeavours. We strive therefore to raise awareness – at all levels of policy decision-making in government and industry, and among the general public – of the critical importance of the study of industrial and environmental toxicology, through many of the same methodologies that will be discussed at this conference, for the protection of the health of all future generations.

In many areas of concern that will be addressed during the conference, science has already provided the technologies for alleviating and eliminating the hazards causing specific problems in the health of children, but what is still lacking is the political will on the part of governments and the will of society in general to ensure that the necessary resources are found and the means deployed to solve the many problems affecting environmental health issues. In many areas we have the scientific and technical knowledge but lack the wisdom and the will to duly address these issues and ensure a safer, healthier environment for future generations.

This conference will mark an important step in this endeavour. May I wish you every success in your deliberations and in your pursuance of the measures to be discussed on addressing the environmental threats to the health of children. There is no issue of greater importance to the health and well-being of all future generations.

The auspicious moment has now arrived and I declare open The International Conference on Environmental Threats to the Health of Children : Hazards and Vulnerability.

Thank you.

Statement by Dr Linda L. Milan, Director, Building Healthy Communities & Populations, WHO Western Pacific Region (WPRO)

Professor Doctor Your Royal Highness Princess Chulabhorn Mahidol,
Your Excellencies, Distinguished Colleagues, Ladies and Gentlemen!

It is a distinct honour and privilege to welcome you to this very special conference. We are indeed fortunate to meet at the kind invitation of the Chulabhorn Research Institute, to address an issue that is of utmost importance to all of us, as professionals, parents and citizens: the protection of children from environmental threats to their health and development.

It is my great pleasure to report to Your Royal Highness on the origin of this initiative, and on the significant and ambitious, but vitally important, objectives of this meeting. In the last few decades, a number of public health advances, in such areas as sanitation, vaccinations, antibiotics, improved nutrition and medical surveillance, have created a safer and more secure world for our children. Our collective efforts have reduced childhood morbidity and mortality, especially in economically developed countries. However, in both industrialized and in developing countries, the health of children remains threatened by the disruption of natural environments and by pollution.

Twenty-eight per cent (28%) of the world's citizens are children below 15 years of age, and the percentage is growing every day. Many of these children have impaired health because of the environments in which they live. A large number of paediatric illnesses are linked to air pollution, unsafe water, lack of sanitation and hygiene, living conditions near waste sites, and also chemicals used at home or in the fields. New-borns, children and adolescents are particularly vulnerable to environmental threats, and informed collective action is required to protect them and promote their healthy development. Children are a nation's future. To protect them is to protect the future of the world. This is the challenge to us all.

The World Health Organization (WHO) is responding to this challenge. WHO is significantly strengthening and integrating its activities related to children's health and development and the environment, with the support of partners and expert advisers.

When Professor Dr Her Royal Highness Princess Chulabhorn Mahidol visited WHO on 27 September 2000, the proposal for this conference was presented. The strong need for a forum to allow discussion of new information available in the scientific domain and to strengthen partnership in the area of children's environmental health and development was recognized. The theme "specific vulnerability of children to environmental hazards" was considered to be a logical first step.

We are extremely grateful to Her Royal Highness Princess Chulabhorn Mahidol, the President of the Chulabhorn Research Institute and a distinguished scientist herself, for so kindly offering to host this International Conference. The Chulabhorn Research Institute, which has as its main objective, "to apply science and technology to improve people's quality of life in tangible ways, as soon as possible", has consistently pursued projects that applied science and technology to improve the quality of life and quality of work. The hosting of this conference is yet another example of the Institute's pursuit of its noble mission. Our meeting has the following objectives:

1. To present and discuss new knowledge, new research results and study methods. We will be examining the effects of pollutants in air, water and food, and looking at the effect of pesticides, persistent toxic pollutants, lead and mercury on children's health.
2. To increase awareness of these environmental threats among health and environment professionals and decision-makers and to stimulate action to reduce them.
3. To follow up the recommendations of a conference held in Manila in March 2000 and to evaluate the progress made since then;
4. Finally, perhaps most importantly, to obtain the commitment of all participants and organizations present here to turn knowledge into action.

Our conference will focus on children's environmental health issues which have the most significant health impact in Asia. While primarily regional in scope, I believe that our discussions and conclusions will be of great interest to a much broader audience as many of the environmental threats to children's health are the same in other parts of the world.

Drafting the Bangkok Statement, a statement setting priorities for action, will be one of our most important tasks this week. Our commitment to implement the Bangkok Statement will be one of our most important jobs when we return to our own countries. Finally, Your Royal Highness, I would like to stress the significance of this event. This Conference represents the culmination of the first stage of the work done by WHO and its partners in the Task Force for the Protection of Children's Environmental Health.

The WHO initiative is supported by the Swedish International Development Cooperation (SIDA), National Institute of Environmental Health Sciences (NIEHS) in the USA, the United States Environmental Protection Agency (US/EPA), and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, with the input from governments, civil societies, NGOs, and UN organizations concerned about the fate of children and adolescents in a changing environment.

The Conference also represents a regional prelude to the first UN General Assembly Special Session on Children, scheduled to take place in May 2002 in New York. At that special session, UN Member States and their leaders will review progress on global goals made in 1990 during the World Summit for Children, and commit themselves to a new agenda for children and young people.

On behalf of the World Health Organization and the other sponsoring organizations, I would like to thank Professor Dr Her Royal Highness Princess Chulabhorn Mahidol for hosting this important conference and providing us with the opportunity to strengthen scientific dialogue, create partnerships, and encourage cooperative research – all of which are fundamental to promoting safe and healthy environments for healthy children.

***Statement by Dr Richard Helmer, Director, Protection of the Human Environment,
World Health Organization (WHO)***

Your Excellency, Personal Representative of Her Royal Highness Professor Dr Princess Chulabhorn Mahidol, Distinguished delegates, Ladies and Gentlemen!

We would like to convey our heartfelt gratitude for the very warm welcome here in Thailand. My colleagues and I remember as if it was last week the visit of Her Royal Highness to the headquarters of the World Health Organization where the idea of the Conference was born. We are very proud, one and half years later to be here for the Conference. The call for the Conference has been heard and felt all around the world.

We are also very proud to have both the WHO and CRI logos jointly in this important initiative. As a token of our deep appreciation, all that is left for me to do today is to offer a small token or a memento to Her Royal Highness.

Thank you.

Annex II - Opening Plenary Statements

Statement by Ms Martha Berger, Office of Children's Health Protection, US Environmental Protection Agency (USEPA)

I am pleased to have this opportunity to say welcome to Bangkok and to this event. I think we are all here for the same reason: we care about children. It is wonderful to see that so many people have come from so many countries to discuss children's health and the environment, especially because children's voices are rarely heard in the policy process.

Children the world over unwittingly rely on us, as government officials, doctors, nurses, engineers, scientists, teachers, and parents, to be their advocates, and so our goal is clear and our responsibility is to do something about it. All of us can do things to help promote children's environmental health.

I come to this field of environmental health after a long career at the US Environmental Protection Agency (EPA). One of the first things I learned was EPA's mission statement, as defined in 1970 when EPA was created. It is very simple: protect human health and the environment. EPA's mission reflects the intimate relationship between the environment and human health. The quality of our air, water, and land has a direct effect on the health of our families – and especially the health of our children.

Throughout EPA's history, it has always been necessary for us to work in concert with a variety of partners. The persistence, motivation and courageous leadership of US civil society in promoting children's environmental health and in demanding their government do something about it was instrumental in making this a priority issue.

The fact that children are not little adults is a fairly new concept to most except those in the paediatric medical community. At EPA, policy decisions are based on the best science available – historically the best science was based on exposures to a 68 kilogram male. As we have learned more, we have understood that what happens to a 68 kilogram male is different from what happens to a 14 kilogram child, let alone an infant.

I would like to highlight a number of recent actions the United States has taken to better protect children's environmental health.

In 1997 the US Government created a multi-agency task force to address children's environmental health issues. This task force includes EPA and our public health, housing, transportation, justice, energy, labor, education, agriculture agencies. With the task force we have developed federal strategies for asthma and lead poisoning and we are now implementing those strategies. The task force is starting to work on school environmental health issues and is continuing efforts to launch a national children's study, a long-term effort to follow children from infancy to adulthood. This study has already been authorized by our Congress.

In the United States we know that almost 5 million children suffer from asthma and that the rate of asthma growth is 160 percent in the last 15 years. Asthma is the leading cause of hospitalization among US children. We also know that exposure to indoor and outdoor air pollutants can make asthma symptoms worse and may cause asthma.

EPA has recently taken action, commonly called the "diesel rule" to make trucks and buses run cleaner, reducing by 2.6 tons annually the amount of smog-causing nitrogen oxide emissions and reducing 110,000 tons of particulate matter. This rule-making activity will prevent 17,600 cases of acute bronchitis in children and will help avoid more than 360,000 asthma attacks and 386,000 cases of respiratory symptoms in asthmatic children every year.

WHO estimates that over 50% of children worldwide are exposed to environmental tobacco smoke. Their exposure is not of their choosing and the results are tragic: children who breathe secondhand smoke are more likely to suffer from bronchitis and pneumonia, coughing and wheezing, more ear infections and more frequent and severe asthma attacks. Recently, Administrator Whitman of the US EPA launched a public awareness campaign to encourage parents not to smoke around their children, and especially not to smoke in their homes.

EPA is primarily a regulatory agency. In order to develop regulations that better protect children, we must have good data on children's susceptibilities to environmental pollutants. EPA and the National Institute of Environmental Health Sciences fund 12 research centers in the United States. They are exploring issues such as environmental tobacco smoke (ETS), asthma, pesticide exposure, particulate matter and ozone, exposures in homes, prenatal exposure, autism, brain development, and methyl mercury.

Dr Phil Landrigan, who will speak later this morning, often says that a large number of chemicals have been introduced into our environment in the last half century, with little or no information about their effect on human health, let alone children's health. To address this, EPA's Voluntary Children's Chemical Evaluation Program provides data to enable the public to better understand the potential health risks to children associated with chemical exposures. This is a very important precedent.

Taking lead out of gasoline has proved to be a great boon for children. Since we began eliminating lead from gasoline in the 1970s, the percentage of children in the United States with elevated blood lead levels has dropped from 88.2 to 4.4 percent.

We encourage all countries to eliminate children's exposure to lead. We encourage countries to measure blood lead levels to make sure that children are protected. We have worked to help reduce children's exposure to lead – most recently with China, Indonesia, and Vietnam. And yet, the World Health Organization says that the majority of children under 2 years old living in cities in developing nations have average blood lead levels greater than 10 micrograms per decilitre.

The World Health Organization also says that more than two million children under the age of five die each year from preventable waterborne diseases. The United States provides technical assistance to countries in Latin America, which are now able to monitor their drinking-water quality from the source to the tap. We hope to replicate this effort in other parts of the world.

The environmental movement in the United States sometimes fails to emphasize that we protect the environment not only because it is better to have clean air than to have dirty air, but because clean air is critical to healthy lungs. This seems so obvious to us that it is hardly worth saying, and yet it is our experience that this message, that there is a critical overlap between ecosystem health and human health, bears repeating over and over again.

We are here in Bangkok today because we recognize that environmental challenges often transcend political boundaries. Though some environmental health threats may vary by country or region, our children's need for clean air to breathe, pure water to drink, and a healthy environment in which to grow and thrive is universal. The differences we face are far outnumbered by the priorities that we share, so we must continue to work together as a global community.

As we meet throughout this week, I hope we will find new ways to work together on behalf of children everywhere. I hope that we will find new ways to build momentum on behalf of children among government officials, environmental and health groups, the private sector, parents and children alike.

This momentum could, in the near future, give children's environmental health a brighter spotlight on the world stage at the UNICEF Special Session on Children in New York in May and at the meeting of world leaders in Johannesburg, South Africa, the World Summit on Sustainable Development.

Children are 30% of our population and 100% of our future. Thriving, learning, growing and healthy children ensure a sustainable future. Their future depends on our efforts.

I urge all of you to find something you can do now to make a difference for the children of Thailand, south-east Asia, and the world over.

Thank you.

***Statement on behalf of the Regional Director, WHO South-East Asia Region
(SEARO)***

Dr Jorge Luna, Regional Consultation on the Protection of Children's Environmental Health, RA-CAH/SEARO addressed the plenary, and delivered welcoming remarks on behalf Dr Uton Rafei, Regional Director, SEARO.

***Statement by Vanessa Tobin, Chief, Water, Environment and Sanitation Section,
Programme Division, UNICEF***

Distinguished guests and participants!

First of all, I wish to thank WHO for involving UNICEF as a collaborating organization for this conference.

As a child-focused international organization, UNICEF is happy to see various sectors paying high attention to children's issues. We welcome and are also doing our best to promote wide alliances for children at international, regional, national and local levels. We have always argued, the priority issues for children – health, nutrition, education, gender equality, etc. – are crucial elements of sustainable development. They are sensitive indicators for judging the level of achievement in sustainable development. Therefore, children's interests should occupy a centre place in national and international development agenda.

Since this conference will address major issues of children's environmental health in depth during the next three and half days, presently I would like to only speak about the overall situation of the world's children, comparing their conditions ten years ago and now.

The last decade saw real progress for children. Sixty-three countries have reduced the death rate of children under five by at least one third. Over 100 countries have cut these deaths by one fifth. Consequently, there are now 3 million fewer under-five deaths each year than in 1990.

The percentage of under-fives who are underweight has continuously dropped since 1980, from 37% then to 32% in 1990 and 28% in the year 2000. The percentage of school-age children enrolled in primary schools rose from 80% in 1990 to 82% in year 2000. The high levels of child immunization reached in the late 80s have been sustained.

Yet, many of the goals set by the world leaders at the World Summit for Children remain unfulfilled. Nearly 11 million children still die each year before their fifth birthday of various preventable causes. 150 million are malnourished. 120 million are out of school.

Some countries stand out for having prioritized child health in their allocation of resources. On the whole, however, national investment in basic health services has not lived up to the promises made by world leaders in the 90s. An important lesson we have learned is that the best results for children come from a mixture of vertical interventions and community-based programmes. We also learned that the involvement of public, private and civic actors at all levels of society is crucial.

As the Secretary-General has pointed out, the "good" and the "bad" of children's experiences across the globe are of mixed trends, such as:

- Unprecedented global prosperity and financial and information linkages – coupled with persistent poverty and rising disparities between rich and poor.
- Growing international partnerships and successful action to eradicate major childhood diseases – simultaneously with rapid social devastation from the HIV/AIDS pandemic.
- A rising awareness of children's rights – coupled with a large number of armed conflicts.
- Continuing local and global environmental degradation, placing ever-greater numbers of children at risk of disease and increasing their vulnerability to natural disasters.

Faced with these challenges, we are compelled to work harder and rally wider support from all relevant players of the civil society to address children's needs and rights, including children's environmental health. That is why UNICEF last year joined the Say Yes for Children Campaign championed by Nelson Mandela

and Graca Machel. The objective of the global movement is straightforward: build a better world for children. The message is also straightforward: the citizens of the world care about children and expect governments to keep the promises they make to them. Ten principles are being promoted in this global campaign:

- Leave no child out
- Put children first
- Care for every child
- Fight HIV/AIDS
- Stop harming and exploiting children
- Listen to children
- Educate every child
- Protect children from war
- Protect the earth for children
- Fight poverty: invest in children.

Finally, I would like to briefly mention the forthcoming United Nations Special Session on Children in May. The Special Session aims to re-enforce the commitments world leaders made in 1990 to children. It also aims to respond to the problems emerging in this rapidly changing world. The Special Session will produce a final document entitled *A World Fit for Children*, which will work to give all children a good start in life and the opportunities to develop to their full potential. The draft outcome document, as it currently stands, has achievable goals in four areas: Promoting healthy lives of children; Providing quality education to children; Protecting children against abuse, exploitation and violence; and Combating HIV/AIDS. Apparently, children's environmental health represents one of the very important aspects of the first theme, i.e. promoting healthy lives of children. I am confident that the results of this conference will provide positive inputs to the global movement for children.

I thank you for your attention and look forward to working with you in the next few days.

Presentation on the Protection of Children's Environmental Health – A Status Report of Developing Countries

Irma R. Makalinao MD, Associate Professor, Department of Pharmacology and Toxicology, University of the Philippines College of Medicine.

“Stepping into the new century can hardly be done without celebration and new visions for the future. But we who work to protect the rights of children should also go into it with anguish and courage.” Carroll Long, Acting Regional Director, UNICEF

The children of today live in a more complex world. Rapid industrialization in different parts of the globe carries with it greater challenges for children in the developing or emerging nations. How much protection are we providing to our children at the moment? To understand how chemicals will impact children's environmental health we need to examine the factors that may modify, compound or even aggravate the way their bodies will handle chronic low-dose exposure to toxic chemicals. UNICEF reports that 150 million children in developing countries are still malnourished. Eighteen million babies each year are still born with low birth weights. Malnutrition can decrease the synthesis of proteins and enzymes that may be necessary in the detoxification of xenobiotics. Their immune response will not be optimal and when chemicals like mercury are present in their bodies, the children's ability to handle an infectious challenge may likewise be compromised. Thus, in the developing world, health care providers must be trained to find the link between paediatric illnesses and the environmental threats to children.

Children are uniquely vulnerable to the effects of chemicals but other factors such as the genetic predisposition, economic, political, social and even religious factors affect the whole picture of children's environmental health in the developing countries. Metals such as lead, mercury and arsenic, pesticides, environmental tobacco smoke, indoor and outdoor air pollution, and water contamination continue to be significant environmental threats to our children's health. Some studies have shown that DDT and other pesticides, PCB, dioxin and some metals can be found in breast milk. However, such information must be handled carefully in developing countries that rely heavily on the mother's milk for infant nutrition.

There must be a global initiative to remove lead from gasoline as this single measure can definitely decrease the lead burden in children and prevent unnecessary lead poisoning. The existing guidelines for lead poisoning by the Center for Disease Control must be re-examined and situated according to the needs of the children in developing countries. After all, there is growing evidence that a “no adverse effect level (NOAEL)” does not exist for lead. In the Philippines, for example, the children exposed to a mining accident showed nerve conduction velocity changes at levels below 20 µg/dl. While the reason for these neurological findings may be multifactorial, the finding of axonal degeneration with some demyelination resolved after chelation and nutritional supplementation with iron and calcium. There is need to revisit the guidelines for chelation therapy among children in developing countries.

How much pesticide exposure are children from developing countries facing today? The chemical paradigm has encouraged “addiction to pesticides”. We know that toxicity studies of pesticides registered in developing countries have been extrapolated from adult data without any provisions for neuro-developmental testing and its potential for endocrine disruption. Studies on the bystander exposure of children are often lacking. In Kerala, where aerial spraying of endosulfan has been reported, neurological and physical abnormalities have been noted. While a direct link has not been fully established, it is necessary to apply the precautionary principle considering that environmental monitoring for endosulfan has been done. Likewise, there are groups of people currently looking at endosulfan as a persistent toxic chemical. With the widespread use of organophosphates it is also essential for health care providers to look at the possibility of diarrhoea being related to chronic exposure to these chemicals.

Children in developing countries are still exposed to environmental tobacco smoke. Upper respiratory tract infection is quite common. The multinational tobacco companies have found the developing countries as a

good market for their goods, now that stricter guidelines are imposed in their own countries. Women and children are the new targets for potential users of tobacco.

Our children also live in highly contaminated areas such as dumpsites or mining sites. Child labour is another important issue that needs attention in developing countries. Children may be helping in farms where pesticides are being applied. They may be employed in the small-scale mining industries where they are exposed to mercury. Some children working in the firecracker industry may develop the "phossy jaw" (i.e. gangrene of the jawbone) because of chronic exposure to phosphorus. A closer look at these children's health will reflect a higher rate of toxicity-induced syndromes, high rate of infectious diseases, immune system disorders, and lower than expected intelligence scores

Clearly, children from developing countries need special protection not only because of their unique physical vulnerability, but the circumstances of their socio-political economic conditions put them at greater risk to exposure to toxic xenobiotics. Chemicals that are banned in the so-called First World should never be allowed to find its way in the developing countries where poverty becomes the issue for why they are brought in. We need to protect our children while the world is unknowingly conducting a vast toxicological experiment. The presence of residual uncertainties must not be the reason for not taking any action when the likelihood of harm has been established. Risk communication is every public servant's job. Together, we must move towards protecting children's environmental health not because the children are our future, but because "our children have a right to their future".

Presentation on the Special Vulnerabilities of Children to Health Threats in the Environment” by Phil Landrigan

Children living in industrialized countries today inhabit a world fundamentally different from that of generations past. The traditional infectious diseases have largely been controlled: smallpox is eradicated, polio is nearly gone, measles is under control, diphtheria and tetanus are rarities, and cholera has virtually disappeared. In the United States, the expected life span of a baby born today is more than two decades longer than that of an infant born at the beginning of the twentieth century.

Children in less affluent parts of the world are not so fortunate. In less developed countries, especially in the least developed countries, infectious diseases – particularly dysentery, pneumonia, malaria, measles, and AIDS – remain the leading causes of paediatric morbidity and mortality. Infant mortality is high. Life expectancy at birth in the United States is 76.5 years, yet in the least developed countries 3 out of 4 people are dying before the age of 50, according to the World Health Organization’s (WHO’s) *World Health Report 1998*.

The environment children face today includes hazards that were neither known nor suspected a few decades ago. They are at risk of exposure to over 85,000 synthetic chemicals, most of which have been developed since the Second World War. In the United States, they are most likely to be exposed to the 15,000 high-production-volume (HPV) chemicals that the U.S. Environmental Protection Agency estimates are produced in quantities of over 10,000 pounds per year. These chemicals are the most widely dispersed in foods, household products, and pesticides, but only 43% of them have been tested for their potential human toxicity, according to the National Academy of Sciences (NAS). And although children are now recognized to be especially vulnerable to chemicals in the environment, only 7% of these HPV chemicals have been examined for their potential toxicity to children.

Children have unusual patterns of exposure to environmental chemicals, and they have vulnerabilities that are quite distinct from those of adults. The particular vulnerability of children to environmental toxicants is due to several factors: 1) greater susceptibility to environmental toxicants; 2) immature metabolic pathways; 3) rapid growth and development; and 4) longer life expectancy than adults. Increasingly, children’s exposures to chemicals in the environment are understood to contribute to the causation and exacerbation of certain chronic, disabling diseases in children including asthma, cancer, birth defects and neurobehavioural dysfunction.

Chemical exposures are expected to become an increasingly serious problem in less developed regions as hazardous industries relocate there, both to take advantage of globalization and to escape stricter labour and environmental laws in more developed countries. The danger that this process poses to communities in less developed countries includes not just increases in everyday exposures, but also catastrophic accidents at production facilities. The chemical explosion in Bhopal, India that claimed more than 2,000 lives in 1984 may unfortunately be a harbinger of future environmental catastrophes in less developed countries. The protection of children against environmental toxins is a major challenge to modern society.

Annex III - Summary of Focus Sessions

Description of Focus Sessions

Each three-hour focus session was devoted to a single children's environmental health issue. Background information was reviewed in brief presentations by each of the two Co-chairs. Short presentations selected from submitted abstracts were then presented and discussed with the group of 15-40 participants attending each session. The rapporteur for each session recorded the discussion and produced the summary reports below. Abstracts for all the talks given during the focus sessions are available in the Conference booklet and supplement.

Focus Session 1 - Environmental Tobacco Smoke: A Global Epidemic

The focus session Chairs highlighted the following points:

- Epidemiology and magnitude of the problems related to tobacco smoke
- Health effects of environmental tobacco smoke (ETS), with emphasis on children
- Various strategies to curb tobacco use
- Incorporating smoking cessation counselling into practice
- The role of a tobacco clearing house within the Southeast Asian region in:
 - Compiling information, research done on tobacco
 - Establishing interest groups to support tobacco control activities
 - Training programmes.

Presentation highlights

- Children as targets of the tobacco industry and potential problem of developing nicotine addiction.
- Knowledge, attitudes and practices of young children (mean age = 10 years) on cigarette smoking.
- The use of nicotine in meconium as a biological marker for both passive and active maternal smoking.
- Occupational hazards among women and their children during the home manufacture of *bidis*.
- Review of available research on tobacco in the South African Region.

Recommendations

- To encourage ongoing communication among members of the focus group
- To do collaborative research in the field of tobacco
- Epidemiological data on the health effects of environmental tobacco smoke in the region
- Sharing of information and increasing awareness on the health impact of ETS
- Tap the paediatric societies to embark on tobacco initiatives.

Focus Session 2 - Hazardous Waste and Scavenging in Open Dumps

The focus session highlighted the following:

- Waste is a problem for all countries on the globe. But it is because of poverty (population dynamics, odd income distribution, lack of opportunities, no access to health / education, etc.) that, in developing countries, some children have to survive by scavenging on garbage.
- Children working as scavengers on dumpsites, often live, eat, drink and play on the site or close to it. They can be continuously exposed to extremely hazardous substances, mainly through breathing contaminated air (open burning) and by direct physical contact with solid and liquid toxicants. Injuries are a major problem.
- Risk assessments have been conducted with children working in or living close to open dumpsites. Most results presented here – like pregnancy outcome, PCB-induced immunity suppression, ARIs and diarrhoeal diseases – remain suggestive, as clear-cut correlation cannot be proven within the group of scavengers. Indeed, they are unorganized and suffer from many other diseases and development problems.
- Scavenging stands for the uncontrolled waste recuperation, salvaging stands for controlled waste recuperation.
- Waste recuperation can be very lucrative, and often represents the only possibility of survival for the poor.
- Corruption is often symptomatic for many ongoing waste management schemes.
- Because of this social group's outcaste status, the scavengers' problems and their dimensions do not reach the concerned professionals or policy-makers.
- Infectious and industrial waste disposal pose a major threat to children's health when such waste is generally disposed of together with domestic and other waste.
- Waste disposal technologies, alone, do not give an adequate answer to the problems posed by hazardous waste. They have to be adapted to local needs and are dependent on the transfer of know-how.
- Existing international agreements, such as PIC, POP and Basle Conventions, have not been addressing the particular risks of scavenging children.
- Waste scavenging is a disgrace, and it is scandalous that children are involved in it. This reality is a direct result of the generalized state of poverty.

Recommendations

1. A first step to reduce children's environmental health risks in open dumps is to recognize that the problem exists: namely, children are living in and from garbage since a very early age. They also work there as scavengers.
2. A next step is to promote waste minimization and segregation at the source. Health care waste, industrial and other dangerous waste need to be disposed of separately in a safe manner.
3. Further, an urgent action is to turn the existing wild dumpsites into controlled landfill sites.
4. Scavenger communities need to be re-located to safer settings with better living conditions.
5. A fourth step to protect scavenging children is to develop and enforce laws forbidding child labour in general and child labour in hazardous settings in particular.
6. Scavengers need to be acknowledged and, by integrating them into society, given the opportunity to organize in order to have safer and more sustainable working conditions.
7. Compulsory mechanisms need to be enforced to ensure that the producers of toxic waste assume their full responsibility to dispose of their waste in a safe manner. This is particularly valid for industrial waste – at national and at international level – and for health care waste.

8. At community level, the issue of waste management needs to be integrated in a holistic manner and should no longer be regarded separately.
9. Privatization of waste management, if done, needs an independent supervision to avoid corruption.
10. The links between unsafe waste management and CEH need to be made more evident to decision-makers and politicians. Therefore research has to be conducted to provide a solid evidence base. Equally important are effective strategic “environmental health” alliances.
11. Poverty alleviation initiatives need to address the case of scavenging children as an urgent priority.

Focus Session 3 - Health Benefits of Water Sector Interventions

The session started with two presentations by the Co-chairs. Dr Batima highlighted the issues related to the limited availability of fresh water, emerging water quality problems in Mongolia and elsewhere and their impact on children, and possible interventions to address these problems.

Dr Tobin reviewed the contamination of groundwater by microbial pollutants and a number of specific pollutants (arsenic, fluoride, nitrates) and the lessons learned from past water and sanitation interventions. She also pointed out that in the past 10 years mortality has decreased, but morbidity due to water-related diseases is on the rise. It was also pointed out that curative measures are important; however, more crucial is prevention, which can be done through interventions like provision of waste facilities and hygiene education.

Dr Sharad Adhikary from Nepal described a “Pilot Programme to support water quality and sanitation interventions in Nepal”.

The presentation included various statistics on water and sanitation coverage in Nepal, and the prevalence of episodes and deaths among under-5 children due to diarrhoea. Provision of water supply, water quality monitoring and sanitation promotion activities were not carried out in an integrated manner. To address the problem, pilot programmes on water quality surveillance and solar disinfection of water (SODIS) have been carried out in some communities through a participatory approach. Such approaches have been found to be successful in promoting sanitation and improvement of existing supplies.

Dr Selim Ahmed from Bangladesh presented a paper on “knowledge, attitude and practice (KAP) of environmental sanitation and personal hygiene of schoolchildren in rural Bangladesh”.

Dr Selim said that the common health problems among schoolchildren in Bangladesh are gastro-enteritis, geohelminthiasis, malnutrition and anaemia. A KAP survey on environmental sanitation and personal hygiene of schoolchildren was carried out and the results of the survey were presented.

Mr Steven Iddings spoke on “Point-of-use chlorination of household drinking-water in the Lao Democratic Republic”.

Due to the prevalence and very high incidence of diarrhoeal diseases and deaths in the remote and mountainous communities in Lao PDR, the government has been implementing a national waterborne disease prevention strategy that includes the establishment of mobile teams, clinical guidelines, outbreak surveillance and hygiene awareness. As part of the strategy a pilot household chlorination scheme targeting six rural villages has been initiated. The application of Aqua Chlor, its impact on the reduction of microbial contamination, and its use at the village level were described.

Dr Krishna Jafa’s presentation was on “The Safe Water System (SWS) in India: A feasibility pilot for reduction of diarrhoeal diseases in urban slums”

It was shown that while access to drinking-water has increased in India, the tremendous adverse impact of unsafe water on health still prevails. Existing technologies to make water safe to drink are unaffordable and inaccessible to most low-income households, particularly those without a regular piped water supply. An appropriate and affordable solution to the problem is the safe water system developed by the Centers for Disease Control and Prevention and the Pan American Health Organization. A feasibility pilot funded by WHO to assess the potential of SWS to reduce diarrhoeal diseases in low-income populations is currently underway in eight slum communities in Delhi.

Recommendations

- Further research that is evidence-based should be conducted on the various causes of diarrhoea.

- Hygiene promotion should be particularly targeted at schools to achieve its best results. While promoting hygiene behaviour, it is important to promote a few key messages, e.g. hand-washing. The IMCI (Integrated Management of Childhood Illness) strategy should be one of the vehicles for promoting health and hygiene. Health workers should work closely with the water sector in this context. More resources need to be allocated/mobilized to fund health, water and sanitation interventions in order to achieve the goals of safe drinking-water and sanitation and maximize the health benefits to children.
- Water-saving technologies and reuse of water should be promoted, especially in areas where there is stress on water supplies.
- The definition of sanitation may need to be expanded to a broader term like waste management, considering rapid urbanization in many countries.
- While promoting sanitation and hygiene education, breastfeeding and nutrition may be included as a package.

Focus Session 4 - Lead Revisited

The session opened with Dr Nelia Cortes-Maramba presenting a comprehensive review of the toxicity of lead in children. Dr Bo Ling then presented data from a study of lead exposure around a lead smelter in China. Dr C.Y. Almirante presented data on the passage of lead across the placenta; she concluded that the placenta is ineffective in preventing the passage of lead from mother to baby. Dr Padungtod presented data on a major environmental spill of lead from a holding pond in the Philippines. Dr Ramirez presented information on lead levels in breast milk and found that these levels are generally low. Dr Joseph Suepinatham presented data showing reduction in children's blood lead in Thailand following the introduction of unleaded gasoline. Dr Ruiz presented a case report on lead chelation.

The following were major themes of the session: Lead is widespread throughout the Western Pacific and South-east Asia regions. However, it is not spread evenly. Highest levels are found in urban areas, near smelters, recycling plants and other polluting industries. A significant number of children in the region have increased blood lead levels. Lead exhibits a range of toxic effects in children that include clinical as well as subclinical effects. Effects on intelligence are seen down to extremely low blood lead levels, possibly as low as 5 µg/dl.

There appears to be no threshold for the toxicity of lead. Lead levels in blood are clearly related to the use of lead in gasoline. This trend was evident in a study from the Philippines, which showed a strong urban-rural gradient in blood lead levels, as well as a gradient which corresponded with traffic levels. The same pattern was seen in Bangkok where blood lead levels declined following the increasing availability of unleaded gasoline. Industry is an important source of lead in the region, especially smelting, mining and uncontrolled recycling.

Several clinical issues were discussed. Is the placenta an effective barrier against passage of lead from mother to foetus? The answer is no. The placenta prevents passage of no more than 10% of lead. Should pregnant women be screened for lead? The conclusion was that the optimal time for such screening is before the conception of a pregnancy, because chelation therapy would then be an option. Chelation is not an option during pregnancy. Nevertheless the participants agreed that lead screening during pregnancy had some value, because if a woman were found to have an elevated blood lead level, she could be treated with calcium, iron and vitamin supplements in an effort to retain lead in her skeleton and prevent it from crossing the placenta. Is the presence of lead in breast milk a problem? The conclusion is generally not, because relatively little lead is transferred from maternal blood to breast milk, inasmuch as most of the lead in maternal blood is bound to the red blood cells.

Recommendations

- Removal of lead from gasoline in all nations in the region as soon as possible.
- To urge the lead-using industry to use clean technology and to engage in full-scale monitoring of emissions and environmental levels.
- Lead concentrations in water should be in compliance with WHO drinking-water standards.
- Lead levels in ceramics should be within acceptable standards.
- Environmental monitoring and blood lead monitoring throughout the region is essential for reducing children's exposure to lead.

Focus Sessions 5 - Pesticides and Persistent Organic Pollutants

This session was attended by scientists and policy-makers from 12 countries, with professional expertise in pesticides, toxicology, environmental health, epidemiology, and environmental engineering.

Dr Smith and Dr Damstra co-chaired the session. Dr Smith made a brief presentation on the use of pesticides in several countries of South-east Asia and noted that cases of pesticide poisoning in children are on the rise. The data indicate that unintentional use of pesticides resulting in poisonings is primarily the result of a lack of knowledge, storage problems, unsupervised/unauthorized dumpsites, and food contamination during transport. In addition, easy availability of and children's access to pesticides, lack of protective clothing and equipment for pesticide users, lack of child-resistant packaging, contamination of clothing of parents engaged in pesticide manufacturing, handling, distribution, and use in agriculture and households also contribute to the high incidence of unintentional poisoning. Dr Smith also described different exposure pathways and scenarios under which children are exposed to pesticides. She also described the commonly observed acute and chronic clinical symptoms of pesticide poisoning.

Dr Damstra made a brief presentation on the problems of persistent organic pollutants (POP) around the world. She referred to the Stockholm Convention Declaration (2001), signed by 23 countries to reduce the residue levels of POP by 2005 and to eliminate them by 2012. She emphasized that most of the POPs have endocrine-disrupting effects among several other adverse health effects, such as cancer, reproductive and developmental toxicity, and neurodevelopmental and immunotoxicological effects. She presented several examples of specific POPs known to be associated with diseases, although she cautioned that these linkages are weak and there is a need to do more research. Examples discussed included TCDDs/PCBs and endometriosis, PCBs and neurodevelopmental toxicity, and DDEs and breast cancer. The timing and extent of exposure during critical stages of a child's development is an important area of investigation.

Five presentations by Dr Halim (Indonesia), Dr Prudente (Philippines), Dr Rengaraj (South Korea), Dr Raj (India), and Dr Vasilyeva (Russia) followed these presentations.

Dr Halim discussed DDT pesticide residues in human milk in certain rural and urban areas of Indonesia. No differences were observed in the levels between urban and rural areas; however, DDT is still being used in public health. Dr Halim emphasized a need for stricter law enforcement.

Dr Prudente discussed a collaborative project of monitoring residue levels of organochlorine POPs (mono- and ortho-chloro PCBs, PCDDFs, PCDDs, DDT, HCHs, chlordane, and HCBs) in human breast milk samples from Japan, India, Philippines, and Cambodia. The pattern and levels of residues in breast milk were low, but the trend was different for each country. For example, Japanese samples had higher levels of PCBs than samples from other countries that participated in the monitoring study. Levels of DDT/HCH were comparatively higher in samples from India.

Dr Rengaraj reviewed the endocrine-disrupting chemicals (EDCs) and health effects. His presentation focused on methods for removal of EDCs and their effectiveness. He discussed three methods – membrane technology, ceramic membrane filtration method, and photocatalytic method.

Dr Raj reviewed the use of pesticides in India. He stated that India is the largest producer and consumer of pesticides in the world. At present, India uses about 80,000 tonnes of pesticides annually to cover 182.5 million hectares of cultivated area. Exposure of farming families, especially women and children to pesticides is very common in workers employed in horticulture, jasmine and tea cultivation. Some of the case studies of pesticide poisonings were presented; however, no direct associations were obvious.

Dr Vasilyeva presented data on residues of dioxins and PCBs in breast milk samples. The data indicated that the samples collected from Volgograd showed significantly high levels of PCBs.

The presentations were followed by general discussion of emerging themes and recommendations from the participants.

The participants in this focus session made the following recommendations:

- Need to determine how globalization has contributed to the unrestricted marketing, distribution, and use of pesticides and the impact of exposure to them on children's health in developing countries.
- Need to develop international standardization of protocols for study designs (e.g. monitoring, sampling methods, analytical procedures, and toxicity testing, etc.)
- Need to consider the effects of climatic conditions and genetic variations in human populations in different countries when comparing pesticide exposure data and their interpretation.
- Need to develop strong partnerships and linkages between governments (federal/state/local), nongovernmental organizations, industries – within and among countries – to share research findings with policy-makers to better implement decisions to avoid unnecessary exposures of the general population, especially sensitive subpopulations such as children and pregnant women, to pesticides and POPs.
- Need to develop and appropriately target regulatory and education strategies that will meet local needs.
- Need to recognize that implementing the strategies to reduce the use of pesticides and POPs is a major challenge, and that any alternatives such as integrated pest management must be cost-effective and easy to apply.
- Need to establish and link up children's environmental centres of excellence across countries in order to share knowledge and experience, to leverage resources and enhance capabilities, and to minimize the burden of pesticides and POPs on children's health.

Focus Session 6 - Air Pollution

This session was characterized by the diversity of presentations from five different countries that addressed indoor and outdoor air problems and their effects on a variety of health outcomes in both urban and rural areas. In the ensuing discussions, environmental tobacco smoke was also identified as a significant problem.

Presentations

Co-Chair Professor David Koh, National University of Singapore, first presented an overview of the effects of various outdoor air pollutants such as total suspended particles (TSP), PM₁₀, NO₂ and SO₂ on respiratory symptoms, lung function and asthma. With respect to the indoor environment, he particularly concentrated on passive smoking, smoky fuels, the burning of mosquito coils, fungi and house dust mites in the home. He concluded his presentation by describing a largely underestimated international public health problem: the haze from widespread and uncontrolled forest fires that cause adverse health effects on millions of residents in many South-East Asian countries.

After an initial round of discussions, Co-Chair Dr Ruth Etzel, George Washington University, invited participants to think about how many parents ever ask about any link between disease symptoms and air pollution. Her presentation used a number of case studies to illustrate how paediatricians should approach patients with an open mind, trying to identify potential risk factors in the environment, in particular the home environment, where most people spend the majority of their time. The home inventory provides a useful tool to identify such risk factors by asking a series of questions, e.g. What fuel is used for cooking? Does anyone smoke at home? Dr Etzel summarized research on the newly recognized risk of acute lung bleeding and sudden death among young infants in the United States exposed to toxigenic molds in the indoor air. *Stachybotrys chartarum*, one of the toxigenic molds, is currently a topic of intense study in North America, where it is found in badly water-damaged buildings.

Professor Habibur Rahman, Bangladesh University of Engineering & Technology, reported on the high levels of air pollution measured in Dhaka City, where the air at all 49 measurement stations is severely polluted according to the Bangladeshi standard, and heavily polluted according to the WHO standard. During the 1998 dry season, 52% of the outpatients at Dhaka Shishu Children's Hospital suffered from acute respiratory infections (ARI) and 33% from wheezing. Between 1996 and 2000 the number of people suffering from air pollution-related diseases increased significantly.

Dr Nigel Bruce, University of Liverpool, United Kingdom, presented the first study describing an association between indoor air pollution caused by the domestic use of wood fuel and reduced birth weight in a human population. After adjustment for a large range of confounding factors the percentage of low birth weights (< 500 g) in three Guatemalan rural population groups was 19.9% (use of open fire), 16.8% (use of chimney stove), and 16.0% (use of electricity/gas), suggesting that the risk of giving birth to low birth weight babies decreases, as one moves up the energy ladder. Because two-thirds of households in developing countries still rely on biomass fuels and women of childbearing age perform most cooking tasks, the attributable risk arising from this association could be substantial.

Dr Nguyen Thi Hong Tu, Ministry of Health, Vietnam, reported on the effects of outdoor air pollution, lead in the air, and indoor air pollution caused by the use of coal on the health of Vietnamese children and workers. Some direct and indirect solutions are proposed in the National Action Plan to reduce air pollution by 2010. These target the living environment (e.g. reduction of charcoal use, proper chimney height) the ambient environment (e.g. phasing-out lead, checking and maintenance of motorcycles) and the occupational environment (e.g. silicosis prevention through the use of new technology and reduced dust production).

Dr Ching Ye Hong, National University of Singapore, described a cross-sectional study comparing the prevalence of respiratory symptoms in children living in three villages in Sumatra (Indonesia) in relation to air quality. The study population consisted of all the children aged below 12 years residing in a village by a river, as well as an inland village and an inland town, both located near trunk roads. The study demonstrated that a higher proportion of children living in the inland village and town experienced respiratory symptoms

when compared with those living in the riverine village. This increased prevalence can be explained by the differences in ambient air concentrations of hydrocarbon and dust particles.

Some 70% of the energy used in Taiyan, the capital of Shanxi province in Northern China, is coal, making it one of the worst polluted cities according to WHO. Professor Deng Xiwei, Taiyuan Epidemic Prevention Station, China, reported on a study that evaluated the effects of ambient air pollution on pulmonary function of 817 primary school children in three different areas. During the heating period, outdoor air pollution, in particular SO₂, prevailed in the heavily polluted areas, while indoor air pollution due to stove use was relatively more severe in the moderately polluted areas. During the non-heating period, a clear ranking with respect to the degree of pollution was not possible.

Conclusions

At the beginning of the afternoon focus session, participants were asked to provide their expectations in writing to the rapporteur: while some participants were hoping to receive answers to fairly specific scientific questions, the majority of the comments related to the need to take action and to bring about policy changes in relation to air pollution and children's health. As a consequence, the discussion mainly focused on the translation of scientific knowledge into action and resulted in the following three conclusions:

- Sufficient scientific data are available to justify action but have not been translated into a format that is understood by policy-makers. Demonstrating the economic burden of the effect of air pollution on children's health could entice policy-makers to take action. Nevertheless, there is a need for local scientific information to help define priorities.
- Problems vary between different settings and countries, and require their own specific solutions. Therefore, despite the value of global thinking and global data, an overall strategy does not exist; however, case studies that demonstrate the effectiveness of interventions can help to devise suitable solutions and inspire society to take action.
- Based on the experience in several countries, it is extremely important to involve many different sectors, e.g. the health, environment, building and energy sectors, when trying to improve children's environmental health. Furthermore, the education sector plays an important role in influencing children and their families directly. There is a strong need for capacity-building across sectors and across different levels.

Focus Session 7 - Environmental Exposures and Development

Dr Roman opened the session by discussing important determinants of reproductive outcomes and child health, focusing on the difficulties of studying environmental health issues due to factors such as the rarity of occurrence, and the dependence on both dose and timing in relation to critical windows of development.

Dr Shu next discussed childhood cancer and the role of environmental influences, such as radiation, pesticides, viruses, parental occupational exposure, cigarette smoke, recreational drug use (alcohol and marijuana), medication, and dietary contaminants including N-nitroso compounds. She discussed the need for future etiological studies to take a multi-disciplinary approach, to obtain large sample sizes, and to carry out improved and expanded exposure monitoring including the use of biomarkers.

Next followed five short presentations by:

- Dr C. Chomchai (Mahidol University, Thailand) – The effect of intrauterine methamphetamine exposure on head circumferences of neonates born at Siriraj Hospital..
- Dr M. Erdenetuya (Ministry for Nature and Environment, Mongolia) – Asthma and its etiology in Mongolia.
- Dr Dilip Mukherjee (Ramakrishna Mission Seva Pratishthan, India) – A longitudinal study of growth of children from birth to 18 months of age in Calcutta: the role of nutrition, illness and the environment.
- Dr Peter Spencer (Oregon Health and Science University, USA) – Natural toxins and childhood disease.
- Dr Troy Tabanas (Satellite Poison Center, Mindanao, Philippines) – A review of congenital anomalies among neonates delivered at Northern Mindanao Medical Center, Philippines from January 1995 to December 2000.

These presentations covered a wide variety of topics, which at first glance seemed difficult to assimilate; however, it became clear that children's environmental health can be impacted by many factors. Ultimately, this led to a discussion about the definition of "environment" which was very inclusive of all factors other than the genetic ones. The group felt that it was important to consider whether any, some or all of these factors may play a role in affecting a child's health.

Factors (or stressors) culled from the five presentations included:

- Natural disasters/climate
- Drugs – medical and/or recreational (including tobacco and alcohol)
- Chemical contamination
- Biological contamination
- Radiation
- Diet/nutrition – quantity, quality, and diversity
- Safe water – quantity and quality
- Clean air
- Cultural factors – including the value of children, priority based on sex under conditions of limited resources
- Socio-demographic factors – including impacts of poverty, over-crowding, access to health care, disease status, child labour.

The focus group's "take home message" was that we, as health care workers, scientific investigators, government officials, and industry representatives, must keep an open mind when assessing and mitigating conditions that have an adverse impact on children's environmental health.

Focus Session 8 - Hazardous Exposures at Home and in the Workplace

The first part of this focus session dealt with the problem of child labour worldwide. A paper and two films (child labour in small-scale mining and in footwear) were presented from the Philippines. The ILO estimates the presence of 120 million children working in hazardous occupations worldwide. In addition to traditional forms of child labour in agriculture, domestic service and micro-enterprises, countries are facing, to varying degrees, even worse and hazardous forms of child labour as child prostitution, trafficking of children, scavenging in dumpsites, work on small-scale mining, sweatshops and deep-sea fishing.

Child labour is caused or determined by multiple factors like poverty, overpopulation and ignorance. Its implications range from detrimental effects on the physical and psychological health and on development to depriving children of their basic right to health, education, and freedom from economic exploitation. Corrective measures and interventions should therefore be broad-based and attuned to the multi-faceted characteristics of child labour prevalent in different circumstances and settings.

In November 2001, a preliminary meeting was held in Manila on “Developing an Asian Network on Hazardous Child Labour” by the ILO’s International Programme on the Elimination of Child Labour to take stock of the interest of Asian institutions in developing programmes to effectively address hazardous child labour, nationally and cross-nationally and through a regional network. Immediate action like advocacy would include the practical application of knowledge gained from surveys of hazardous work, particularly regarding the immediate and long-term effects on children’s health. This project is now operational, drawing on close cooperation of various social partners – at local, national and international levels – such as workers and employers associations, NGOs, health and safety professionals, and academics.

The second part of the session discussed issues and concerns on household and traffic-related hazards.

Household and traffic-related hazards represent important environmental threats to children. Examples include injuries from falls, scalds and other burns, drowning, pedestrian and motor vehicle-related injuries, and poisoning from exposure to toxic household products. Trauma results in enormous amounts of suffering and disability for the individual child and his or her family. In aggregate, such injuries also represent one of the most important public health problems facing every country throughout the world, accounting for a large percentage of a nation's health care expenditure and extracting a terrible toll in terms of disability and years of productive life lost.

In addressing risks to children from various environmental threats, none is more important than attempting to control and prevent injuries from household and traffic hazards. Strategies for controlling such injuries should include attention to primary, secondary, and tertiary preventive measures, a mixture of both active and passive prevention techniques. The most effective injury control programmes will combine technological advances with educational initiatives, in a context of whatever nationwide health policy and regulatory changes are needed to promote a lowered risk of injury.

Focus Session 9 - Mercury: Exposure and Health Effects

The major themes of this session were:

1. Mercury is a metal that produces toxic effects on human and animals, and has no beneficial value on physiological function. It occurs in three forms – elemental, inorganic and organic; their effects and toxicokinetics are different.
2. Mercury creates problems in both developed and developing countries, and the sources of mercury contamination may vary. As it is a global pollutant, more global concern is warranted.
3. Children and pregnant women are the high-risk groups.

Recommendations

- Exposure to mercury should be minimized.
- Uses of mercury should be phased out, especially for medical purposes.
- Environmental monitoring in high-risk areas should be undertaken.
- Health screening and monitoring of women of child-bearing age in high-risk areas should be carried out. Health advice and guidelines on fish consumption and on alternative sources of protein should be provided.
- People should be informed and alerted on the toxic effects of mercury to human health as well as on the sources of contamination.
- Mercury intoxication can be clinically diagnosed, and the body burden due to mercury can be lowered by treatment.

Focus Session 10 - Children's Environmental Health: Policy Issues

The theme of this session was 'putting knowledge in practice'. The presentations provided examples of policy interventions which span the spectrum, ranging from the most local, or home- and school-based level to the community, national and international level.

On a local, home or school level, Dr Herath discussed malaria prevention and the large number of policy interventions. In Sri Lanka, malaria accounts for 26% of infections of school-age children, who are absent from school 5.3 days for each episode, creating a big impact on cognitive performance. In adults, malaria accounts for 25% of all work days lost. Many malaria issues are addressed through the Global Malaria Control Strategy and the Roll Back Malaria Initiative. Other strategies should be emphasized, including protection from bites and reduction of transmission risk; enhancement of the availability of insecticide-treated mosquito nets and evaluation of their effectiveness; provision of free or subsidized nets, local production of low-cost nets, and import tax exemptions on nets; drug policy and drug development support; demonstration that poor housing design is a risk factor, and promoting improvements in housing quality and design; promotion and support for evaluation of methods such as water management and other precautionary measures; promotion of an integrated approach to vector management and control. Dr Herath's models may be useful for protecting children from other environmental health hazards.

Also on the local level, a presentation on school education in India by Dr Aurora showed that children are powerful change agents. The younger children were provided facts on children's environmental health and those in the higher grades were taught skills for political action. Posters from the schools were presented, demonstrating a sophisticated level of understanding on the part of the children. Learning in schools was extended to homes.

A presentation on Integrated Management of Childhood Illness (IMCI) illustrates policy intervention on a community level. Dr Peltó explained the origins of IMCI, which uses community health services to promote healthy care-giving behaviours for families as a systematic way of managing illness. IMCI was developed by WHO to deal with major killers, such as malaria and diarrhoea. It was recommended that WHO should explore the potential for adapting IMCI to incorporate children's environmental health issues.

Dr Lam illustrated the importance of working at village and national levels in planning and responses to natural disasters. Natural disasters, in fact, point to the need for planning and response at a local, home or school level and at the international level as well. Natural disasters are daily events, with damage and deaths rising over time. In the Asia-Pacific region, naturally-occurring storms hit those least able to afford good housing, and combined with the large numbers of people living on coasts in poverty and without good education, the effects are compounded. Children are most vulnerable and youth organizations can play a critical role in protection.

On a national level, Dr Guthrie explained the work of the Children's Institute, which mobilizes youth for advocacy to address children's environmental health issues. The success in changing laws on tobacco advertising is an example of the Institute's work. Dr Guthrie emphasized the importance of an open 2-way dialogue between researchers and policy-makers.

On an international level, the need to protect children from chemical and biological terrorism was emphasized by Dr Le. Children's needs differ from adults in terms of care and treatment after an attack, and therefore paediatricians must be involved in planning. Also on an international level, Dr van den Hazel explained the work of the International Network of Children's Health and Environmental Safety, which is a platform for sharing information and stimulating action on children's environmental health.

The participants discussed some overarching policy interventions, including the need for rights-based approaches; specific policy interventions to control malaria; formal mechanisms and forums to strengthen linkages between research results and policy responses; expansion of use of precautionary approaches; examination of the unintended consequences of development activities on children's environmental health;

clarification of roles between different sectors of society; and a new “report card” that measures children’s quality of life, including morbidity.

Finally, it was recognized that a lot of good activity is going on in different places, but there is a critical lack of coordinated sharing and support mechanisms. Finally, the session was enriched by the children who created posters on children’s environmental health, with great artistic success.

Focus Session 11 - Asthma and Immune Diseases

Dr Peter Sly highlighted the growing realization of the importance of early life events in development of many childhood and adult diseases, including asthma. The interaction between environmental factors (i.e. maternal smoking or allergen exposure during pregnancy, environmental allergens, viral infections) and genetic susceptibility in the development of asthma is well accepted, but recent evidence indicates that the developmental stage at which this interaction occurs is critical to determining the outcome. A model of asthma mechanisms showing the different factors that may lead to asthma that persists into adult life was presented.

Based on the above-mentioned models on the genesis of asthma, Dr Sethi mentioned various factors which have been shown to decrease the development of atopic diseases in children who are at higher risk of developing these kinds of disorders, and can be used for primary prevention of asthma. They include: decreasing maternal exposure to allergens during pregnancy, stopping maternal smoking in pregnancy and after delivery, decreasing the exposure to indoor allergens like house-dust mites during infancy, encouraging exclusive breastfeeding, and the use of hydrolysed formula feeds for supplementation.

Erdenechimeg, Naranchimeg & Erdenetuya presented data on the prevalence of asthma in Mongolia and the probable etiological factors in this country. With an overall prevalence below 2%, there is growing concern of the increase in the number of asthma cases. A study by Radnaakhand (1999) showed an occurrence of asthma in children of $8.0 \pm 0.9/10,000$, with a four times higher incidence in urban areas than those in rural areas. The study also showed that the prevalence of asthma differed according to the region, with a higher prevalence in the Gobi Region (5.4 ± 2.2) and lower in the mountainous regions (2.6 ± 1.3 to 1.8 ± 1.2). The authors highlighted that in Mongolia 70% of asthmatic children under five and 60% of asthmatic adults have family histories of atopy. Predisposing factors in a Sub-district of Ulaan Bataar, Khornoo, which has a 2.3% prevalence of asthma were discussed. Among these, genetic factors and outdoor/indoor air pollution, tobacco and alcohol use as well as diet were mentioned as possible players with a role in the increasing number of asthma cases in the country. In the absence of primary prevention programme, the incidence of asthma cannot be reduced and future action will be to focus on this.

Although air pollution has been pointed out as one factor contributing towards the dramatic increase in the incidence of respiratory allergic hypersensitivity in children over the last century, studies have not conclusively proved its role in the genesis of asthma and other allergic disorders. Two studies were presented: one discussing the correlation between the increasing incidence of asthma with the abundance of traffic-related air pollutants, and the second on the environmental impact in the progression of atopic dermatitis.

In Taiwan the incidence of asthma among children has risen from 1.3% in 1974 to 10.8% in 1997, which tops the Asian countries, and asthma appears in the list of 10 more frequent causes of death in children under 15 years of age. H. Houg introduced the Taiwan air quality monitoring network (TAQMN) and presented the results of an analysis of data collected during the year 2000 by the Environmental Protection Administration (EPA) from surveys on Middle School Students' Respiratory System Health Examination, conducted during the past several years. This survey showed a prevailing rate of asthma (defined in this study as "diagnosed by a doctor or an episode of wheezing in the last 12 months") of 6.7 % among male children and 4.2 % among female children. When this data were analysed and compared with the complete SO_2 , NO_x , PM_{10} , CO and O_3 data collected by EPA-Air quality monitoring stations, it was found that middle school children's asthma prevalence was positively correlated with the abundance of traffic-related air pollutants, especially CO and NO_x .

Y. Heo et al. presented preliminary data from an ongoing study to investigate the relationship between environmental pollution and progression of atopic dermatitis in Korea. They are investigating the roles of lead and components of diesel particles on the production of allergic responses. In addition, the activities of two nongovernmental pro-environment organizations were presented.

Annex IV - Summary of Children's Environment Health Indicators Meeting

6 March 2002 - Bangkok

Introduction

The Chair of the meeting, Dr Landrigan, welcomed the participants, and invited Ms Rehfuess to give an overview of the process that WHO had taken to develop indicators for children's environmental health (CEH). In her presentation Ms Rehfuess stressed the lack of good data and the need for information in relation to CEH, and outlined the use of existing environmental health indicators, international expert consultations, and reviews in the process of developing CEH indicators.

Dr Briggs introduced environmental health indicators as an important tool to show time trends, to identify spatial and temporal patterns, and to define and motivate action. He described the linkages between exposure-side, health-side and action indicators, and outlined the approach that distinguishes between the child in the home, community and ambient environment. This relatively simple model is embedded in the more detailed DPSEEA framework (Driving force, Pressure, State, Exposure, Effect and Action). Dr Briggs showed system diagrams for road traffic and physical injuries as examples to illustrate the use of the DPSEEA framework. Such diagrams give justice to the complexity of the many relationships between environmental exposures and health effects, and can help to identify points for the definition of suitable indicators. Defining and designing such indicators will particularly need to take into account the user (temporal and spatial issues) and the purpose of use.

He led into the discussion by posing the following questions:

- What need do Member States have for CEH indicators?
- What are the crucial CEH issues?
- In what settings do these occur?
- Does the proposed framework work as a basis for selecting and structuring indicators?
- What is feasible? What can be delivered in terms of indicators – nationally?

General Discussion

During the discussion that followed, participants agreed on the approach taken by WHO. They were supportive of the distinction between the home, community, and ambient environment as a good model, as it allows to focus on specific problems at different levels, especially at the household level.

However, while the overall framework for CEH indicators is provided by WHO, a bottoms-up approach will be needed to build individual indicators that can account for spatial and temporal issues as well as the user's questions. This could be achieved as part of an indicator development and application workshop. Defining policy indicators presents a particular problem as they differ according to the level looked at, i.e. home, community and ambient environment, and between rural and urban settings. In this context, remedial actions refer to downstream prevention (e.g. availability of poisons unit, access to health care) although health interventions may represent a suitable intermediate solution.

While it is difficult to incorporate the socioeconomic dimension into individual environmental health indicators, general socioeconomic indices, e.g. the poverty index, can be included alongside the environmental health indicators.

Developing indicators to “solve” the problem of children’s environmental health was met with a fair amount of scepticism, as they may re-define the problem rather than help to solve it. It was questioned whether, besides lead, there were any examples of environmental health indicators that have been used to good social purposes over the past ten years. Most importantly, indicators do not stand alone: they only represent one small part of the information that needs to be provided to policy-makers. There is a strong need for monitoring/tracking systems and for information exchange and multi-sector collaboration. It was pointed out that some indicators are already available and used at the local or national level by different agencies. These could be integrated into the overall framework.

Given the limited amount of time for discussions and the key objectives of the meeting, participants were invited to submit any comments and suggestions relating to specific indicators by sending an email to Ms Rehfuss or Dr Briggs. Regarding key children’s environmental health issues, additional indicators should be included relating to lead (Dr McMichael), arsenic from mining, IQ (Dr Boonyakarnkul), and conflicts and war (Dr Khan).

Suggestions

Dr Boonyakarnkul recommended that additional information be provided on the WHO website or as a WHO Fact Sheet, describing what CEH indicators are and what their purpose is. Clear guidance on the use of CEH indicators will be needed by countries.

Dr von Hildebrand suggested that a definition of children’s environmental health be included in the publication to avoid misunderstandings.

Ms Allen mentioned that the U.S. Environmental Protection Agency, UNICEF and WHO aim to use indicators to “tell the story” of children’s environmental health at the Rio+10 meeting in Johannesburg in August 2002. Three key areas – diarrhoeal diseases, acute respiratory infections, and lead – could help to raise awareness about CEH among senior decision-makers and at the same time publicize knowledge about indicators.

Several participants stressed the need for a field trial and evaluation of the indicators. Pilot studies for indicators in specific areas such as lead or indoor air pollution could be carried out, and Dr Khan suggested that EMRO would be happy to be involved in such pilot studies.

Dr Bakir mentioned that many models for taking action are based on a causal analysis that defines where the intervention should take place. He suggested to make the link and model immediate, underlying and structural causes.

Dr Landrigan stressed that a very simple list of indicators could serve as an easy-to-use checklist for policy-makers, e.g. whether countries are using certain pesticides, or have an import ban on certain chemicals.

Dr Makalinao outlined a core set of CEH indicators that could be defined by starting with the key children’s environmental health outcomes such as neuro-developmental disorders, diarrhoea, acute respiratory infections, etc. Going back to the general causes (social, economic, cultural, political) and specific causes (environmental exposures) would allow the generation of a child-specific set of environmental health indicators.

Annex V - Closing Statements

Address at the Closing Session by Dr Khunying Mathuros Ruchirawat

Distinguished Colleagues, Ladies and Gentlemen!

The international conference on environmental threats to the health of children: hazards and vulnerability, in which we have all participated through the last 4 days was initially conceived as being largely regional in its scope, focusing on children's environmental health issues in South East Asia and Western Pacific regions. It has, however, because of the global importance of the topic, attracted a far wider participation with delegates from over 40 countries. This is an indication of the level of concern over the impact of pollution, and other environmental factors on children's health of countries in all parts of the globe, representing both developed and developing economies.

The presentations in both the plenary and the focus sessions over the last four days have been outstanding for the insights they have given on the wide range of issues and research currently being undertaken into all aspects of children's environmental health.

Although environmental degradation and the health problems it brings is increasing globally in both reach and magnitude, the speakers at this conference provide hope that if we effectively utilize the methodologies now available to us through scientific research, we can overcome many of the problems and find effective ways to protect the health of children.

The priorities for action that we have articulated in the draft of the "Bangkok Statement" provide the basis for hope in achieving a cleaner environment, in which children will no longer be in jeopardy due to the health threats of industrial pollution and the many other sources of pollution and disease that spring from the imbalances in our global community.

To effectively protect our children from environmental threats to their health, more research is very much needed. This research must cover fundamental principles to reveal underlying causes, experimental research to unmask the association between cause-and-effect relationships, as well as clinical research to explore applications of our knowledge and strategies for remediation and cure.

To achieve our research goals, cooperation among researchers, research groups and institutes in both developed and developing countries is of the greatest importance. We must find effective mechanisms to foster and facilitate this cooperation. One such mechanism could be the establishment of a network as proposed in the Bangkok Statement under the four critical areas of protection and prevention, health care research, empowerment and education, and advocacy. Thus our Bangkok Statement is a pledge to take effective and immediate action.

Thank you all for your invaluable participation in this landmark event.

Closing Statement by Dr Uton Muchtar Rafei

Regional Director, World Health Organization, South-East Asia Region

Distinguished participants, dear colleagues, ladies and gentlemen!

First of all, I would once again like to thank Professor Dr Her Royal Highness Princess Chulabhorn, President of the Chulabhorn Research Institute, and the Chulabhorn Research Institute for agreeing to host and co-organize this International Conference on Environmental Threats to the Health of Children.

Unfortunately, due to previous commitments, I was only able to join this important meeting today. Nevertheless, I have learnt that the presentations and focus session discussions were of high quality and of significant relevance in addressing the issues concerning environmental threats affecting the health of our children.

Although the annual number of deaths among children less than 5 years of age has decreased, still every year more than 10 million children in developing countries die before they reach their fifth birthday. Seven in 10 of these deaths are due to acute respiratory infections, diarrhoea, measles, malaria or malnutrition and often a combination of these conditions. The environment in which the children live contributes immensely to their health or disease burden. Diarrhoeal diseases are associated with unsafe water and poor sanitation coupled with poor food-handling practices. The poor air quality and toxins released may contribute to the recurrent episodes of ARI which millions of children in our region suffer from every year.

For the last three decades or so, environmental health has been understood as being a question of merely maintenance of the environment. The issue is, however, more complex: environmental health is about promoting a healthy environment to ensure good health. Thus, the inter-linkages between health and environment are evident.

A good example is indoor air pollution, where exposure to a single environmental factor, namely, smoke from the use of bio-mass fuels or petrol-derived fuels results in an increasing number of respiratory infections. The severest impact of this environmental hazard is borne by the most vulnerable group, namely, children under five years of age.

Children's environmental health problems call for a concerted cross-sectoral response. This is well documented in some of the countries where the use of leaded gasoline has been banned. This positive initiative not only contributed to lowering ambient air pollution, but also resulted in an increase of the average IQ of the student population due to the reduction in the amount of lead in human blood. Certainly, this achievement was possible because of the close cooperation between all the concerned stakeholders.

There are also other examples of the benefits of successful interventions in the water sector. Yet, we need to recognize that long-term sustainable water management schemes can only result from the fostering of partnerships and collaboration among the different sectors. Now, we have a new challenge facing some countries in the Region: arsenic contamination of groundwater.

To address this environmental threat, a concerted response will be required.

We should keep in mind that concerted responses addressing environmental hazards affecting children and adolescents will require their active participation. What is also needed is the involvement of their families, the community as well as schools and local authorities.

This Conference has highlighted the fact that the environment in which our children live today differs from the past, as we now have to deal with hazards that were not known or suspected just a few decades ago. The relocation of hazardous industries in developing countries as a result of globalization and decentralization may increase exposure to environmental health hazards. For this reason, it is most important that we produce evidence-based data to advise policy-makers on this important issue. As this Conference stressed, the

ongoing WHO initiative to develop a core set of Children's Environmental Health indicators for policy support at national and international levels can be instrumental in collection of vital data. I am very pleased to see that all these issues are clearly addressed in the Bangkok Statement.

Though this Conference is coming to an end, a new beginning is being made next week. WHO and UNICEF are organizing the First Global Consultation on Child and Adolescent Health and Development, titled "A Healthy Start in Life" on 12 & 13 March 2002 at Stockholm, Sweden. This high-level Consultation, to be attended by Prime Ministers and Health Ministers is linked to the UN Special Session on Children in May 2002, where world leaders will re-affirm their commitment to building a world fit for children.

As mentioned during the first day of the Conference, I wish to assure you of my commitment and that of my Regional Office to support this initiative and to act upon the recommendations of this Conference.

With this, I declare this Conference officially closed and wish you all a safe journey home.

Annex VI - Programme of the Conference

Sunday 3 March 2002	16:00 - 19:00	Official Opening <i>His Excellency Dr Vichit Sri-sa-an, Special Representative of Professor Dr Her Royal Highness Princess Chulabhorn Mahidol, CRI Dr Linda Milan, WHO/WPRO Dr Richard Helmer, WHO/HQ</i>
Monday 4 March 2002	09:00 - 09:30	Welcoming Remarks <i>Dr Martha Berger, EPA Dr Vanessa Tobin, UNICEF Dr Jorge Luna, WHO/SEARO Dr Richard Helmer, WHO</i>
		Opening Plenary <i>Chair of the Conference: Dr William Suk, NIEHS, USA Vice-Chair of the Conference: Dr Mathuros Ruchirawat, CRI, Thailand</i>
		Announcements <i>Dr Jenny Pronczuk, WHO</i>
	09:30 - 10:00	Protection of Children's Environmental Health - Status in Developing Countries <i>Dr Irma Makalinao, Philippines</i>
	10:00 - 10:30	Special Vulnerabilities of Children <i>Dr Philip Landrigan, USA</i>
	10:30 - 11:00	Tea/Coffee Break
	Session 1	Water, Food and Disease <i>Co-Chairs: Dr Peter Spencer and Mr Chetphan Karnkeaw</i>
	11:00 - 11:30	Vector-borne Diseases in Children <i>Dr Sustriayu Nalim, Indonesia</i>
	11:30 - 12:00	Water Supply Contamination and Sanitation Issues in Asian Countries <i>Dr Chongrak Polprasert, Thailand</i>
	12:00 - 12:30	Arsenic and Fluoride in Drinking Water <i>Dr Baoshan Zheng, People's Republic of China</i>
	12:30 - 13:00	Food safety, Nutrition and Children's Health (incl. feeding patterns) <i>Dr Xu Ying, People's Republic of China</i>
	13:00 - 14:00	Lunch

Monday 4 March 2002	14:00 - 17:00	FOCUS SESSIONS
		1. Environmental Tobacco Smoke: a Global Epidemic <i>Dr Rahmat Awang, Malaysia, Co-Chair</i> <i>Dr Sophie Balk, USA, Co-Chair</i> <i>Dr Irma Makalinao, Philippines, Rapporteur</i> <i>Presenters: T Guthrie, I Makalinao, EM Ostrea, R Ramya</i>
		2. Hazardous Waste and Scavenging in Open Dumps <i>Dr Genandrialine Peralta, Philippines, Co-Chair</i> <i>Dr Choei Konda, UNEP/ROAP, Co-Chair</i> <i>Mr Alexander von Hildebrand, WHO/SEARO, Rapporteur</i> <i>Presenters: TQ Nguyen, SJ Perez, HA Qdais, S Rajamani</i>
		3. Health Benefits of Water Sector Interventions <i>Dr Vanessa Tobin, UNICEF, Co-Chair</i> <i>Dr Pulsamaa Batima, Mongolia, Co-Chair</i> <i>Ms Payden, Bhutan, Rapporteur</i> <i>Presenters: S Adhikary, S Ahmed, S Iddings, K Jafa</i>
		4. Lead Revisited <i>Dr Bo Ling, People's Republic of China, Co-Chair</i> <i>Dr Nelia Cortes-Maramba, Philippines, Co-Chair</i> <i>Dr Phil Landrigan, USA, Rapporteur</i> <i>Presenters: CY Almirante, C Padungtod, GB Ramirez, J Suepinatham, MCT Ruiz</i>
		5. Pesticides and Persistent Organic Pollutants <i>Dr Nerida Smith, New Zealand, Co-Chair</i> <i>Dr Terri Damstra, WHO, Co-Chair</i> <i>Dr Bob Sonawane, US EPA, Rapporteur</i> <i>Presenters: FXS Halim, MS Prudente, S Rengaraj, Raj, E Vasilyeva</i>
Tuesday 5 March 2002	17:00 - 19:00	6. Air Pollution <i>Dr David Koh, Singapore, Co-Chair</i> <i>Dr Ruth Etzel, USA, Co-Chair</i> <i>Ms Eva Rehfuess, WHO, Rapporteur</i> <i>Presenters: N Bruce, XZ Deng, CY Hong, THT Nguyen, MH Rahman</i>
		(with Tea/Coffee Break from 15.00 to 15.15)
		POSTER SESSION and Refreshments
Session 2	Air, Climate and Disease <i>Co-Chairs: Dr Ali Khan and Dr Nigel Bruce</i>	
08:30 - 09:00	Air Pollution and Children's Health <i>Dr Bimala Shrestha, Nepal</i>	
09:00 - 09:30	Indoor Air Pollution and Children's Health <i>Dr Karpala Balakrishnan, India</i>	

	09:30 - 10:00	Asthma and Upper Respiratory Diseases: Role of the Environment and Lifestyles <i>Dr Peter Sly, Australia</i>
	10:00 - 10:30	Global Environmental Change and Children's Health <i>Dr Tony Mc Michael, Australia</i>
	10:30 - 11:00	Tea/Coffee Break
	Session 3	Injuries, Poisonings and Radiations <i>Co-Chairs: Dr Nerida Smith and Dr Michael Firestone</i>
	11:00 - 11:30	Update: Global Implications of Childhood Poisonings <i>Dr Alan Woolf, USA</i>
	11:30 - 12:00	Injuries and Accidents in Children <i>Dr Myint Myint Thein, Singapore</i>
	12:00 - 12:30	Ultraviolet and Other Radiations Affecting Children <i>Dr Colin Roy, Australia</i>
	12:30 - 14:30	POSTER SESSION and Lunch
	14:30 - 18:30	FIELD TRIPS (Preceded by a short briefing) Kanaratbamrung Pathum Thani: A Health-Promoting School Ban Saladang Village: Community-based Approach to Water and Waste Management
Wednesday 6 March 2002	Session 4	Developmental Disorders <i>Co-Chairs: Dr Nguyen Thi Hong Tu and Dr Bob Sonawane</i>
	08:30 - 09:00	Overview and Scope of the Problem: Reproductive, Immune and Respiratory Development <i>Dr David Carpenter, USA</i>
	09:00 - 09:30	Neurobehavioural Effects of Environmental Agents <i>Dr Prahlad Kishore Seth, India</i>
	09:30 - 10:00	Persistent Organic Pollutants and Endocrine Disruptors <i>Dr Terri Damstra, WHO</i>
	10:00 - 10:30	Environmental Exposures and Childhood Cancer <i>Dr Xiao Ou Shu, USA</i>
	10:30 - 11:00	Tea/Coffee Break
	11:00 - 11:30	Lead and Development <i>Dr Mahmood Khwaja, Pakistan</i>
	11:30 - 12:00	Socioeconomic Stressors: Scavenging <i>Dr Theng Lee Chong, Malaysia</i>

Thursday
7 March 2002

- 12:00 - 14:00 **POSTER SESSION**
and Lunch
- 14:00 - 17:00 **FOCUS SESSIONS** (Break out groups, in parallel)
- 7. Environmental Exposures and Development**
Dr Eve Roman, UK, Co-Chair
Dr Xiao Ou Shu, USA, Co-Chair
Dr Michael Firestone, US EPA, Rapporteur
Presenters: C Chomchai, M Erdenetuya, D Mukherjee, PS Spencer, TJ Tabanas
- 8. Hazardous Exposures at Home and in the Workplace**
Dr Alan Woolf, USA, Co-Chair
Dr Dulce Estrella-Guste, ILO – Philippines, Co-Chair/Rapporteur
Presenters: LC Agosto, RR Alejandro, SK Gupta, NA Smith, DG Villamangca
- 9. Mercury: Exposure and Health Effects**
Dr Stephan Böse-O'Reilly, Germany, Co-Chair
Dr Ana T Francisco-Rivera, Philippines, Co-Chair
Dr Winai Winankul, Thailand, Rapporteur
Presenters: D Adambekov, NB Beck, AT Francisco-Rivera, GB Ramirez
- 10. Children's Environmental Health: Policy Issues**
Dr Le Hung Lam, Vietnam, Co-Chair
Dr Gretel Pelto, USA, Co-Chair
Dr Martha Berger, US EPA, Rapporteur
Presenters: M Arora, T Guthrie, LH Le, P Herath, PJ van den Hazel
- 11. Asthma and Immune Diseases**
Dr Peter Sly, Australia, Co-Chair
Dr GR Sethi, India, Co-Chair
Dr Jorge Luna, WHO/SEARO, Rapporteur
Presenters: R Erdenechimeg, Y Heo, H Hounng
- Session 5** **Towards the Protection of CEH**
Co-Chairs: Dr Lilian Corra and Dr Irma Makaliniao
- 08:30 - 10:00 **Highlights of the Focus Sessions**
Coordinators: Dr Katherine Shea and Dr Bimala Shrestha
- 10:00 - 10:30 **Environmental Burden of Disease: Indicators and Information Needs**
Dr David Briggs, United Kingdom
- 10:30 - 11:00 Tea/Coffee Break
- 11:00 - 11:30 **Tools for the Practitioner:
Taking the Environmental History of Children**
Dr Sophie Balk, USA

- 11:30 - 12:30 **Building Partnerships: Research, Capacity Building and Interventions** (Round table)
Coordinators: Ms Joy Carlson and Dr Irma Makalinao
- *Dr Ruth Etzel, American Academy of Pediatrics*
 - *Dr Rahmat Awang, Asia Pacific Association of Medical Toxicology*
 - *Dr Winadda Piyasil, Thai Pediatric Association*
 - *Dr Peter van den Hazel, International Network on Children's Health, Environment and Safety*
- 12:30 - 13:00 **Highlights of Plenary and Poster Sessions**
Dr Phil Landrigan, Mount Sinai Hospital, USA
Dr Jenny Pronczuk, CEH Task Force, WHO
- Conclusions of the Conference: "Bangkok Statement"**
Dr Richard Helmer, Director PHE, WHO
Dr Mathuros Ruchirawat, Vice-President, CRI
- Closing Ceremony**
Dr Bjorn Melgaard, WHO Representative, Thailand
Dr Uton Muchtar Rafei, Regional Director, WHO SEARO
- 13:00 - 13:30 **Children's Session**

Annex VII - List of Participants

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