Environmental Health in the USA: Chemical exposure to air pollutants in the US-Assessment and response.

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Introduction.

I want to thank the Korean Society for Preventative Medicine, Ministry of Environment (Eco-technopia project), and Dr. Jong-Han Leem from Inha University for the invitation to speak at this conference. The title of my presentation today is Chemical Exposure toAir Pollutants in the United States- Assessment and Response. The issues associated with chemical air pollutants are multi-faceted in nature, and a challenge to explain. These issues include describing the best we know about the science of pollutants, the exposure and resulting health effects. Although governmental policy should be science-based, often policy considerations and economic concerns shape our response. In any national arena, the historical and cultural context must be considered to understand the options for assessment and response. In describing for you the United States approach to air pollutants, I will discuss the approach that was implemented in three separate venues, each which has its own set of unique characteristics. First, I will like to discuss the national program for regulating air pollution, as characterized by the Clean Air Act. Secondly, I will like to describe air pollution issues in the workplace. Finally, I will to discuss unique issues which face individual communities. In each of these venues, I will start with the regulatory situation. In most cases, regulations have been established that take into account the known science and address necessary policy issues. However, these regulations provide little in the wayof instructions for the protection of public health. We could spend all afternoon discussing possible improvements based on emerging science, but that debate is not a productive one because of controversies often associated with emerging science and policy applications. I will follow up the description of the regulatory picture with a discussion of the involvement of public health agencies beyond the regulations-how public health agencies and groups in the United States are able to supplement the regulatory environment to protect its citizens. I believe that you will find that a flexible, assertive, action-oriented position must supplement regulations for an adequate response in today's world. Finally, I will describe where we hope to go in the future to improve our response to pollution.

The national program addressing air pollution issues.

The history of air pollution goes back at least to the 1300s in England with the increased use of coal instead of wood for heat. Major problems with pollution existed with the advent of the Industrial Revolution in the developed countries in the 1800s. In the 1900s major pollution events resulting in deaths occurred in Meuse Valley, Belgium (1930),

Donora, Pennsylvania (1948), and London, England (1952). The worst air pollution to date disaster occurred in Bholpal, India in 1984 with an estimated 4,000 deaths.

A number of facts became evident from these and other incidents. First, the relationship between exposure and health effects is evident for those extreme instances where exposures to high concentrations of pollutants resulted in severe adverse . The issue of health effects from lower concentrations of pollutants is still sometimes an issue for debate. Many of these situations tended to be regional in scope, and thus this limits the ability of local jurisdictions to appropriate address the problems.

In recognition of these facts, the United States passed the first national legislation on air pollution in 1955. The passage of the Air Pollution Control Act of 1955 was arecognition of the need for a national program to address the issues associated with the protection of public health and the environment. This legislation has been extended by the Clean Air Acts of 1963, 1970 and 1990. To understand how the United States addresses air pollution issues, I must explain the governmental structure in place. The individual states making up the United States have fundamental responsibility for health, safety and welfare of the citizens of the state. Thus the states have the fundamental responsibility for enacting laws and promoting regulations to safeguard the health of the citizens. However, because as previously note, air pollution is a national issue going beyond state borders, the federal government has takenthe responsibility for setting standards. In an partnership-like arrangement, states can continue to have the lead in this area by implementing standards at least as stringent as the federal standards in what is called a state implementation plan. The federal government assists the states by providing scientific research, expert studies, engineering designs and money to support clean air programs.

The responsibility for the federal implementation of the federal rules of the Clean Air Acts is the US Environmental Protection Agency, or EPA. This implementation starts with the identifying and characterizing "criteria"air pollutants. These are pollutants that can injure health, harm the environment, and cause property damage. The regulation of these substances begins with developing health-based criteria and science-based guidance, as the basis for setting permissible levels. The first set of standards, the primary standards, protects health. A second set of standards, secondary standards, is intended to prevent environmental and property damage. The standard for a substance is defined within a geographical area called an attainment area. The regulation of a substance within an attainment area is controlled by issuing permits for

allowed releases for an operating process within a plant.

In geographical areas where pollution limits are exceeded, special programs are implemented to attempt to bring emissions within required limits. I would like to provide several examples where special emphasis has been placed on pollution reduction efforts. In the case of automobile emissions, actions include cleaning up fuels, use of alternate fuels, auto inspections, and improved car designs. In a situation associated with power plant operation, the use of coal asfuel results in emissions of sulfur dioxide. This substance is the initial ingredient for the formation of acid rain. This problem is being addressed by a program of emission reduction, which includes a market-based exchange system. In the 1970s it was realized that the release of certain classes of compounds found in many consumer products were reducing the protective ozone layer in the atmosphere. A ban on the production of chlorofluorocarbons and other similar substances in the mid-1990s is a significant effort to address this problem.

A notable public health success story is the elimination of lead additive to gasoline, and thus, lead emissions from automobile exhausts. In 1976 lead levels in gasoline were reduced to minimize the adverse impacton the function of automobile catalytic converters. With this reduction in lead usage, the Centers for Disease Control and Prevention (CDC) was able to show in the second National Health and Nutrition Examination Survey (NHANES) in the time period 1976-1980 that the declines in actual blood lead levels measured in people matched declines in levels of lead in gasoline. Based on this finding key policies were enacted to completely eliminate the use of lead additives.

The system is far from perfect. The scientific basis for many substances of concern is still evolving, particularly when lower levels of pollutants are the focus of interest. This situation is further complicated by the realization that the policy choices in these cases may require expenditures of millions of dollars for limited returns on public health impact. Such substances include mercury, particulates, and sulfur dioxide.

Worker health and safety.

In discussing air pollution a special situation exists with respect to workers working with toxic materials. First, the possibility exists in the workplace for much high concentrations of substances to occur. Secondly, workers in the workplace have the potential to be exposed to higher levels of toxic substances than those found in the general population. Hence the situation requires special emphasis to insure a safe working environment.

In the United States the federal Occupational Safety and Health Administration (OSHA) is responsible for issuing standards and rules for safe and healthful working conditions. With regards to chemical exposure, OSHA sets chemical exposure limits called Permissible Exposure Limits (PEL). For an individual substance, the PEL is the concentration of a substance to which most workers can be exposed without adverse effects averaged over a normal 8 hour workday.

These regulations have legal requirements, with penalties to be applied when limits are exceeded. There are other recommendations for exposure limits and options for insuring a safe working environment such as engineering controls. Much of this other activity is the responsibility of the National Institute of Occupational Safety and Health or NIOSH.

NIOSH, an Institute with the Centers for Disease Control and Prevention, CDC, was formed at the same time as OSHA, that is, in 1970. The agency was established to help assure safe and healthful working conditions within the workplace by providing research, information, education and training in the field of occupational safety and health. NIOSH provides national and work leadership to prevent work-related illness, injury, disability, and death by gathering information, conducting scientific research, and translating the knowledge gained into products and services. As a non-regulatory agency, NIOSH conducts research and makes recommendations based on research results to protect workers. Two important services that I would like to describe to you are the development of non-regulatory guidelines for worker exposures and the health hazard evaluation program.

With respect to non-regulatory guidelines for worker exposures, Recommended Exposure Limit or REL is an occupational exposure limit recommended by NIOSH as being protective of worker health and safety over a working lifetime. The REL is used in combination with engineering and work practice controls, exposure and medical monitoring, labeling and posting, worker training and personal protective equipment to insure a safe working environment. This limit is frequently expressed as a time-weighted average (TWA) exposure for up to 10 hours per day during a 40 hour work week. The limit may also be expressed as a Short Term Exposure Limit (STEL) that should never be exceeded and is to be determined in a sampling time, usually 15 minutes. If the workplace exceeds the REL, considerations should be given for employing personal protective equipment for the worker. NIOSH has also established values associated with exposures which are life threatening. The IDHL values, or Immediately Dangerous to Life or Health, refer to acute respiratory exposures that pose an immediate threat of loss of life, as the name implies. Exposures at this level may result in irreversible or severe health effects, such as eye damage, or irritation or other conditions that could impair an employee's escape from the hazardous atmosphere. NIOSH guidance for chemical exposures provides science-based recommendations for employers to follow in protecting workers.

Health Hazard Evaluations are a service provided by NIOSH to assist workers or employers in investigating and identifying problems in the workplace and making recommendations for remediation. A Health Hazard Evaluation is a study of a workplace. It is done to learn whether workers are exposed to hazardous materials or harmful conditions. Based on the nature of the request, NIOSH staff may respond with helpful information or referral to a more appropriate agency, discuss the problem in detail and provide recommendations, or conduct a visit to the workplace. When visiting the worksite, NIOSH staff interview employees and the employer and tour the facility. They may review records, measure exposures and do medical testing. At the

end of this evaluation, NIOSH provides a written report to the employer and to the employees. A Health Hazard Evaluation can be requested by employees of the federal, state or local governments, or the private sector. Examples of situations which might lead to an evaluation are: employees with an illness from an unknown cause; employees exposed to an unregulated agent; employees experiencing adverse health effects; the need for medical or epidemiological investigations to evaluate a hazard; a higher than expected incidence of a particular disease; exposure to a new or unrecognized hazard; or a hazard resulting from the combined effects of exposure to several agents. These evaluations are a free service, conducted by well-trained professionals, separate from enforcement activities and do not result in citations, penalties or fines. I would like to describe to you several examples of these evaluations to give you a picture of the process and the results.

NIOSH was requested by a union to conduct an investigation of a processing plant in Pennsylvania. Employees were concerned that working conditions in the bag, press, and extrusion departments were contributing to sinus infections, coughing, sneezing, sore throat, and eye irritation. During the site visit, personal and area air sampling were conducted for ozone and volatile organic compounds (VOCs) in the extrusion department, VOCs in the press department, and VOCs, formaldehyde, acetaldehyde, acrolein, and particulates in the bag department. Twenty one employees were interviewed from all areas of the plant. Every tenth employee was selected from a list of 290employees who worked the day shift. Interviews covered employees' work history, past medical history, smoking history, and current symptoms, complaints, and concerns. The concentration of formaldehyde ranged from 0.04 to 0.09 parts per million (ppm). Thisexceeds the NIOSH Recommended Exposure Limit (REL) of 0.016 ppm, but is below the Occupational Safety Health Administration (OSHA) and American Conference of Governmental Industrial Hygienists' (ACGIH) criteria. Concentrations of acrolein, acetaldehyde, ethanol, isopropanol, 1-propanol, ethyl acetate, propyl acetate, butyl acetate, and toluene were below all recommended and regulatory levels. Particle size characterization indicated that 99.9% of the particles were in the respirable range, with a concentration of 0.32 milligram/cubic meter (mg/m3). This is below the OSHA Permissible Exposure Limit (PEL) of 5 mg/m3 and the ACGIH's recommended value of 3 mg/m3 for respirable particulates. A majority (57%) of interviewed employees reported upper respiratory ormucous membrane irritation, which they associated with smoke in the bag department. The haze is a result of emissions during the bag manufacturing process. Chemicals used in the manufacturing process of the bags, such as formaldehyde, acrolein, acetaldehyde and VOCs, are likely to be found in the haze. It is possible that low levels of exposure to these chemicals can result in irritating effects. Air sampling results indicate the presence of a variety of chemical substances in the press, bag, and extrusiondepartments. However, quantitative measurements of most of these substances indicate that airborne concentrations are below those believed to result in chronic health effects, though some irritating symptoms might occur with minimal exposure. Recommendations

are included in this report to further improve the air quality in the bag department by introducing dilution ventilation in addition to the local exhaust ventilation currently in place. Following the ventilation changes, the concentrations of formaldehyde and particulates should be monitored again.

The second example is one of a request of a federal agency, the US Department of Energy. NIOSH was requested to review work conditions for contract employees working on the Hanford Site in Richland, Washington. Specifically, NIOSH was requested to evaluate the potential for exposures and health effects of vapors emitted from hazardous waste storage tanks. The tanks contain a mixture of chemical and radiological waste which is being transferred to another location for processing into glass. Although there is no occupational exposure limit (OEL) for the mixture of chemicals and compounds that may be present in vapor that escapes from the tanks, OELs do exist for some of the individual vapor constituents. NIOSH investigators determined that employees at the Hanford Site may be exposed to vapor mixtures emanating from the "head space" (air space above the tanks'liquid contents) area of the tanks and that these exposures, on occasion, may be in sufficiently highconcentrations to pose a health risk to exposed workers. The tank farm workforce was not routinely provided personal protective equipment (PPE) to protect them from tank vapors. Exposure data for individual workers were limited in quantity and quality, not easily accessible and, in some situations, had not been obtained until hours after an accidental exposure had occurred. Due to these data limitations, the true exposure potential was difficult to ascertain. Of the 54 interviewed workers, 35 reported a variety of acute and chronic health concerns they believed were related to vapor exposures. Those interviewed were also concerned about the available PPE and the adequacy and accuracy of the environmental monitoring which had been performed. To ensure their safety, NIOSH investigators recommended that, at a minimum, a NIOSH approved air purifying respirator be provided to any worker entering a tank farm to protect against exposure to nuisance vapors. For workers entering known vapor release areas, higher levels of respiratory protection may be required, such as powered air-purifying respirators equipped with high-efficiency particulate air filters and organic vapor/ammonia cartridges, airline respirators, or self-contained breathing apparatus. NIOSH also recommended that the employer routinely sample the head space of the tanks and conduct personal sampling while the employees are working. Results from this sampling should then be discussed with employees to develop mutually agreeable strategies for further sampling and appropriate personal protection. NIOSH investigators determined a potential for significant occupational exposures and health effects from vapors released from the hazardous waste storage tanks. Although the concentrations of the compounds in thevapor will change over time and during waste movement activities, vapor constituents may be present at sufficiently high concentrations to pose a health risk to workers. Recommendations are given in this report to help protect workers, including providing, at a minimum, air purifying respirators to workers and routinely sampling the head space of the tanks and the personal breathing zones of the workers.

The community.

As described previously, in the United States, issues of health, safety and welfare are primarily the responsibility of state and local officials. Thus, if, in the judgment of these officials, laws and regulations are necessary beyond what is required on a national level, they have the option of developing and implementing more restrictive legislation. I would like to describe actions recently enacted within my own state of Georgia as an example of the exercise of this option.

In the 2005 legislature, a bill was introduced citing the need to control exposure to second hand smoke which is present in areas where smokers are allowed to smoke. Facts cited include: Estimates that 65,000 Americans suffer an early death due to exposure to smoke, second hand smoke is a known carcinogen, and is particularly hazardous to the elderly and individuals with impaired respiratory function. Children exposed to second hand smoke have an increased risk of asthma, respiratory infections, sudden infant death syndrome, development disabilities, and cancer. Studies have demonstrated that simple separation of smokers and nonsmokers is not an effective method for eliminating exposure. Economic analysis has demonstrated that the impact of restricting smoking will not have a negative economic impact for the hotel and restaurant communities. The stated purpose of this legislation "are to protect the public health and welfare by prohibiting smoking in public places and places of employment and to guarantee the right of nonsmokers to breathe smoke-free air, and to recognize that the need to breathe smoke-free air shall have priority over the desire to smoke". Upon passage of the bill and signing by the governor of the state of Georgia, only three primary exceptions exist for smoking in public buildings. The law exempts bars and restaurants where no persons under18 are served or employed; businesses employing fewer than 10 people; and businesses which provide a ventilated break room. In the last case, smoking is only allowed in the ventilated break room and not in other areas of the business establishment.

In addition to enacting laws and regulations, local communities can be assisted by agencies within the US Public Health Service in addressing public health concerns or issues. I would like to provide several examples from my own agency, the Agency for Toxic Substances and Disease Registry, or ATSDR, in assisting communities in identifying and addressing community issues.

First, let me describe ATSDR. ATSDR is a federal public health agency. ATSDR is part of the Public Health Service in the U. S. Department of Health and Human Services. ATSDR is not a regulatory agency like the U. S. Environmental Protection Agency. Created by Superfund legislation in 1980, ATSDR's mission is to **prevent exposure and adverse human health effects and diminished quality of life associated with exposure to hazardous substances from waste sites, unplanned releases, and other sources of pollution present in the environment.** Through its programs - including surveillance, registries, health studies, environmental health education,

andapplied substance-specific research - and by working with other federal, state, and local government agencies, ATSDR acts to protect public health.

The ATSDR has a process called a Petitioned Public Health Assessment in which a community member, not necessarily an official, can request that the agency conduct a health assessment regarding a site or situation within the community. Public Health Assessments consider : what levels (or "concentrations") of hazardous substances are present; whether people might be exposed to contamination and how (through "exposure pathways" such as breathing air, drinking or contacting water, contacting or eating soil, or eating food); what harm the substances might cause to people (the contaminants' "toxicity"); whether working or living nearby might affect people's health; and other dangers, such as unsafe buildings, abandoned mine shafts, or other physical hazards.

ATSDR looks at three primary sources of information to make these determinations: environmental data, such as information about the contaminants and how people could come in contact with them; health data, including available information on communitywide rates of illness, disease, and death compared with national and state rates; and community concerns, such as reports from the public about how the site affects their health or quality of life.

The first example I will describe demonstrates how ATSDR can support the community in instances of significant public health threats. Beginning in 1997 ATSDR received a number of complaints from community members near a foam and fiber padding facility in Glenola, North Carolina. Polyurethane foam was manufactured by reacting a resin, typically a polyether such as polyoxypropylenetriol, with 2, 4 and 2,6-toluene diisocyanate, or TDI, and water. For certain higher quality grades of foam, methylene chloride (MeCl) is used as a blowing agent. The ingredients are mixed and deposited onto a moving conveyor, and the polyoxypropylenetriol resin and the TDI polymerize and cross-link to form the urethane resin in the shape of a continuous foam-like structure called a loaf. The loaf dries in a cooling chamber, where exhaust fans draw off chemical emissions for 20 to 30 minutes. These emissions peak during the first 2 minutes of the blow-off, when pressure inside the foam bubbles exceeds the pressure outside. The foam continues to off-gas rapidly for the next 5 to 10 minutes. After this period, off-gassing becomes diffusion controlled. Emissions are directed to stacks, which direct them to the ambient air; no emission controls are in place. The manufacturing processes at the foam facility occur in batches which result in episodic releases of emissions.

The residents reported a number of symptoms, including dizziness, breathlessness, headaches, nausea, loss of memory, flushing of the face and neck, fatigue, lethargy, sleeping difficulties, and difficulty breathing. They reported significant reduction of symptoms after leaving the area near the facility. The health effects described duringthese telephone calls are similar to those described by residents in one-on-one sessions with ATSDR staff during a public availability session in May 1997. In August ATSDR and EPA staff measured ambient air using flame ionization detection monitors. Results indicated total volatile organic compounds in

the residential location at levels from 2 to 6.2 parts per million (PPM). In September, officials from the North Carolina Department of Environment and Natural Resources found reading for volatile organiccompounds at levels of 3.5 to 5 ppm in community air, 5 to 10 ppm at the fence-line of the facility and 100 ppm inside the foam curing facility. Based on these results North Carolina officials ordered all operations to cease at the facility.

In October, ATSDR issued a Public Health Advisory for this facility. A Public Health Advisory is a way for ATSDR to respond quickly when hazardous substances released into the environment pose an immediate and significant danger to people's health. It is a notice sent directly from ATSDR's administrator to EPA's administrator that alerts EPA to a public health threat. Other government agencies such as state and local health and environmental agencies are also notified about the problem. In this case notice was transmitted to NIOSH, North Carolina officials and Randolph County officials. ATSDR concluded based on the information above that emissions from the facility were resulting in off-site air concentrations of contaminants at levels that might pose a serious threatto public health. Follow up suggestions included environmental monitoring and biomonitoring. Because of the significant health threat and the lack of engineering controls to stop the emissions, the facility has not been reopened.

A second site that ATSDR has been involved in is in Warren township, Ohio. In this community residents were concerned about symptoms indicating exposure to hydrogen sulfide. A landfill containing construction materials, notably, drywall, was implicated as the source of the emissions. Of special concern to ATSDR was the fact that approximately 1600 students attended a high school and two elementary schools near the landfill. ATSDR began its investigation in the Warren Township Community in August 2002 with a public availability session to gather health concerns. More than 150 residents reported similar health effects that they and their families were experiencing, including nausea, headache, vomiting, eye irritation, fatigue, dizziness, and memory loss. Preliminary, unvalidated air samples collected by the landfill's contractor detected a peak concentration of 13 parts per million (ppm) hydrogen sulfide in residential outdoor air. Exposures to this concentration of hydrogen sulfide have been associated with the kind of health effects reported in the Warren Township community. To more fully evaluate exposures, ATSDR conducted an Exposure Investigation, sampling indoor and outdoor air in seven community locations for five months. Air sampling during the Exposure Investigation detected a maximum concentration of 6.1 ppm in residential outdoor air, a level that has been demonstrated to cause headaches and airways restrictions in experimental studies of people with asthma. Some levels were above those associated with increased asthma-related hospital visits for children and reports of eye irritation in occupational and animal studies. Using the detected concentrations of hydrogen sulfide in residential areas and uncontrolled releases from landfill conditions, ATSDR concluded that these conditions posed an urgent public health hazard to citizens of Warren Township. ATSDR uses the "urgent public health hazard"designation for sites at which short-term exposures (less than 1 year) to hazardous

substances or conditions could result in harmful health effects that require rapid intervention.

Continued community concern and continued odor complaints prompted the Ohio Department of Health's State Epidemiologist to request that ATSDR help conduct a health investigation in late May 2004. ATSDR conducted the field portion of this investigation in June and July of 2004. Participants in this study consisted of 107 community members who live, work, or attend school within a 1-mile radius of the facility. From results of a pre-screening respiratory questionnaire, participants were placed in one of three categories: 1) those with existing respiratory conditions, such as asthma (50 people), wore personal air-monitoring badges, kept a daily diary of odors and symptoms, and tested their lung function twice aday using a peak-flow meter instrument, 2) those without existing respiratory conditions (50 people) wore the personal air monitoring badge and kept the daily diary or 3) those who only kept a daily diary (7 people). Residents of five homes also allowed ATSDR to place hydrogen sulfide outdoor air monitors in their yards for the study period. ATSDR anticipates presenting our findings to the community in late spring or early summer of this year.

During the field data collection phase of this study, ATSDR used a real-time hydrogen sulfide monitor to respond to community odor complaints. During one such response, ATSDR found levels of hydrogen sulfide up to 95 ppm in residential air. This prompted a letter from ATSDR's Assistant Administrator to the Warren CityHealth Director. The letter stressed the urgent nature of these elevated hydrogen sulfide readings and recommended the city 1) develop the capacity to monitor for hydrogen sulfide in response to future odor complaints; and 2) develop contingency plans with city, township, and Trumbull County emergency response personnel to shelter-in-place or evacuate community members, based on hydrogen sulfide readings. The City Health Department agreed to work with the City Wastewater Treatment Plant in sharing hydrogen sulfide monitoring devices, and also to pursue contingency planning.

ATSDR has determined that residential exposures to hydrogen sulfide pose a health hazard to residents in the Warren Township community. The position of the landfill within an existing community, in combination with construction and maintenance inadequacies of the landfill, has allowed these conditions to become a substantial problem for the health and safety of nearby residents and for the state of Ohio. These concerns have led Ohio EPA to request federal actions to stop emissions, and work is underway to complete this work.

Views of the future.

I would like to describe two activities which I think illustrate future initiatives in two areas. The first activity is the effort over the last ten years to develop a consensus on health guidance values for use in acute releases situations. Since 1996 I have represented ATSDR on a federal advisory committee, the EPA Advisory Committee to Develop Acute Exposure Guideline Levels (AEGLs), to review technical support documents and health guidance values derived by this

effort. After approval by the committee these documents are made available for public comment, revised, and forwarded to the National Research Council for review, approval and publication. Several characteristics of this approach are worth noting. This effort represents a major pooling of resources from the public sector, federal and state agencies, and the private sector, including representatives from academic, professional and private sector groups. It includes a significant cross-section of scientists in toxicology and related fields from both the public and the private sector fostering a consensus among the entire scientific community. Because of the endorsement of the National Academy of Sciences, the premier science body in the United States, the final results are national, standardized acute exposure guideline levels for all federal and state agencies in the public sector, private companies, and non-profit organizations in the private sector. With the additional inclusion of representatives from France, Germany and the Netherlands, efforts are being made for international harmonization of these health guidance values. I believe this represents a great resource for policy makers by summarizing in a comprehensive fashion the known toxicology for a given substance and the expected human effects at different levels of exposure.

The committee reviews guidance values developed for varying time periods, ranging 10 minutes to 8 hours. For each of the time periods a guidance value is set for a various endpoints: perception of exposure; serious toxicity, or impairment of escape; and potential lethality. Progress to date is 24 technical support documents and associated AEGL values published in final form. This information is available on the internet. The committee has review a total of 139 chemicals. The stated work objective is to finalize documents for 20 compounds a year.

In my final example of future programs for public healthresponse in the arena of environmental issues, I will discuss the concept of tracking environmental public health information. In the 1990s the concept evolved in the use of evidenced-based medicine where clinical treatments are directed by a doctor's expertise, the best available clinical evidence and the patient's preference. This concept is being applied as the CDC addresses its future as the nation's public health agency. The CDC is developing an evidence-based approach in setting agency goals for the future. Once this plan is implemented, an evaluation will clearly identify public health strategies. It is noteworthy that in the last decade a significant emphasis in the US has been placed on prevention activities. Indeed the CDC is officially known as the Centers for Disease Control and Prevention. However the information necessary to make informed judgments with regards to environmental public health, and conduct an intervention program, is currently severely limited.

In 2001 the Pew Commission published a report describing the poor status of environmental health which sharply contrasts with progress in other biomedical fields. The report notes that if we are to profit from the exciting new knowledge of genetics and the human genome, we must have basic information about the health of our citizens and the environment. The report

describes the lack of basic information that could document possible links between environmental hazards and chronic disease as the environmental health gap. The examples cited are particularly striking. In the United States, only four states report tracking autoimmune diseases, such as Lupus, even though there is increasing evidence to suggest rates of these diseases are rising. The environmental links are unknown. Most states do not track severe developmental disabilities like autism, cerebral palsy and mental retardation. The National Academy of Sciences has estimated that 25 percent of the developmental disorders in children are caused by environmental factors. Most states do not track endocrine and metabolic disorders such as diabetes and neurological conditions such as migraines and multiple sclerosis. These diseases have increased 20 percent in the population between 1986 and 1995. For most of the United States there is no systematic tracking of asthma despite the fact that the disease has reached epidemic proportions and is the number one cause of school absenteeism. Birth defects are the leading cause of infant mortality in the United States, about 6,500 deaths annually. The cause of 80 percent of all birth defects and related conditions remain elusive even as evidence mounts that environmental factors play an important role. Currently less than half of the United States is covered by birth defects registries. This lack of data contrasts with the fact the currently we track 50 infectious diseases on a national basis.

The Pew Commission proposes a multi step approach as a plan for addressing the environmental health gap. The plan suggests a national baseline tracking of diseases and exposures through a network of local, state and federal public health agencies. Diseases and conditions to be monitored include birth defects, developmental disabilities, asthma and other respiratory diseases, cancer and neurological diseases. Exposures would also be monitored, identifying exposures such as persistent organic pollutants, heavy metals, pesticides, air contaminants and water contaminants. A second component in the plan is a early warning system of sentinel environmental events. The current partnership of hospitals, poison centers and public health agencies would provide a tracking network for food and waterborne illnesses and track early signs of outbreaks of health effects that may result from environmental factors. Regional network of states would be supported to respond to concerns on the regional level, feed data into the national database system, and test new approaches for monitoring environmental health indicators. Another component of the proposed system is a cadre of trained investigators to respond to health concerns identified by the network. While this capability exists for response to infectious outbreaks, the country currently lacks a similar ability to respond to chronic disease investigations. A final component of the system is a strong community network of groups able to articulate local concerns and issues and insure the applications of lessons learned on the local level.

After the publications of the report by the Pew Commission, funding was made available in 2002 for the National Center for Environmental Health, CDC, to initiate the National Environmental Public Health Tracking Program. By 2004, funding for the program was 27.4

million US dollars. The collaborating organizations include 20 state and local health departments, 3 schools of public health and several professional organizations as well as other federal agencies. This initial funding program identified five funding objectives; including building environmental public health capacity, increasing collaboration between organizations, identifying and evaluating existing data systems, building partnerships with communities and nongovernmental organizations and develop model systems to link environmental and health data.

The final objective of the program is to provide information from a national network of integrated health and environmental databases that drives actions to improve the health of communities. The strategic plan for the network identifies three distinct components: hazard monitoring, exposure surveillance, and health effects surveillance. CDC is establishing the network by drawing on a wide range of expertise from federal agencies, state and local health and environmental agencies, non-governmental organizations, state public health and environmental laboratories and schools of public health. This program is in the initial stages of formation.

Data from this program can be used to identify areas and populations most likely to be affected by environmental contamination and to provide important information on the health and environmental status of communities. The network will provide valuable data on trends that can be used to study the possible relations between the environment and noninfectious health effects. The data can be used to drive public health policy and actions that ultimately will reduce the burden of adverse health effects on the American public. The strategic plan for this effort calls for building a sustainable National Environmental Public Health Tracking Network, enhancing associated workforce and infrastructure, information dissemination, advancing environmental public health science research and fostering collaboration among health and environmental programs. Initial reports from this program describe a survey of public health state and local tracking needs and priorities and the statistical approaches which can be used for this type of data. Proposals for model state systems have been advanced for childhood cancer, pediatric asthma, pesticide exposure and exposure-related behaviors.

A critical aspect of this network is defining a set of hazards to be monitored. This menu of hazards has been established collaboratively as part of the program, and defined as Environmental Public Health Indicators. With respect to air pollution issues, hazards to be studied include criteria pollutants or toxic substances in ambient air, motor vehicle emissions, tobacco smoke or toxic substances in indoor air, and unsafe or unhealthy environmental events. We can look forward to significant finding in the near future from this new and innovative program.

Summary

In summary, air pollution issues in the United States are addressed by a core group of regulations supplemented by active interventions as needed by public health agencies. The strategies employed by public health officials must be flexible and innovative to address the needs of the citizens. As you can see from the examples cited above, the collaboration of public health agencies can be critical in protecting communities from adverse exposures. In the US state and local governments have the primary responsibility for health and safety issues, including those associated with air pollution. The federal agencies have responsibilities when activities between states are involved and or the issues are of national significance. Significant challenges and opportunities remain to identify the relationship to air pollution and other environmental factors and the incidence of disease, and hence develop and implement intervention strategies.

Thank you for your attention- I would be pleased to answer any questions you might have.

The findings and conclusions in this presentation have not been formally disseminated by the Agency for Toxic Substances and Disease3 Registry and should not be construed to represent any agency determination or policy.