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Committee on Science
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Mr. Chairman and members of the Subcommittee, I am pleased to have the opportunity to be here today to discuss the Fiscal Year 1999 budget request for the U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD) and to describe the highlights of ORD's current and planned research. Since we appeared before this Subcommittee last year, Dr. Robert Huggett, former ORD Assistant Administrator (AA), has left the Agency and I have been designated as Acting AA. I am proud to report to you that the reorganization and redirection engineered during the last three years is now bearing the promised fruits of high quality, relevant science in support of the Agency's mission. ORD has continued to evolve into a first rate environmental research organization, that is focused on delivering results.

Last year, in our discussion of ORD's 1998 budget request, we told you that we were aspiring to work on the most critical environmental issues, using the highest quality science, supported by the Nation's best environmental scientists. We indicated that we were making significant progress toward achieving these goals because ORD's program innovations insured:

- research priorities based on the **highest risks** to people and the environment,
- research products strengthened through **rigorous internal and external peer review**, and
- research expertise enriched by **recruiting the best environmental scientists** outside of EPA through our Science to Achieve Results (STAR) program.

Our FY 1999 Budget Request shows that these improvements are solidly in place and that we are accomplishing our goals. ORD's research priorities align with EPA's Strategic Plan and national environmental goals, and our research planning process has been synchronized with the principles articulated in the Government Performance and Results Act (GPRA). Our specific Research Plans and Strategies have been customized to meet the needs of EPA's Program offices and peer reviewed by external stakeholders. Core Research Plans relate to Pollution Prevention, Ecosystem Protection and Human Health Risk Assessment. Problem Driven Research relates to Microbes and Disinfection By-Products in Drinking Water, Particulate Matter, Arsenic in Drinking Water, Endocrine Disruptors, Global Change, EMAP, and Waste Research.

Together with funding proposals from other Federal Agencies, our budget helps comprise the President's new Research Fund for America which reflects the President's commitment to ensuring long-term stabilitiy and growth for civilian research programs. Under the auspices of the White House's National Science and Technology Council, and independently, we have forged mutually beneficial partnerships with other Agencies, to coordinate and leverage our research dollars and ensure government-wide solutions to national environmental problems such as harmful algal blooms, environmental status and trends, endocrine disrupting compounds, global climate change, and fine particles.

We have strengthened our in-house research through a program of competitive, peer-reviewed internal ORD research awards that will spark innovative exploration and resolution of emerging environmental issues by our own in-house scientists. And, as part of our reinvention efforts, we are complementing the depth and experience of our onboard scientific staff with our Post Doctoral Initiative that will infuse our workforce with new state-of-the-science trained, post doctoral scientists and engineers into research positions. This initiative is a key element of ORD's "succession" planning to assure that our in-house science strength is maintained as a portion of our maturing work force nears retirement age. These initiatives will help match scientific disciplines of researchers with Agency priorities and provide career development and mentoring to scientists and engineers in environmental fields.

Our organizational and management evolution continues and is clearly demonstrated by accomplishments that I would like to highlight to provide a context for discussing our FY 1999 budget proposal.

EXAMPLES OF RECENT SCIENTIFIC PROGRESS

As you know, ORD has several avenues by which we contribute to the advancement of environmental science. Our chief role is to conduct and support high quality research targeted to understanding and resolving the Nation's most serious environmental threats. In addition, we develop methods and technologies to reduce exposures to pollution and prevent its creation. We are also major players in the arena of information sharing on technological innovations to protect people and the environment. We prepare health and ecological risk assessments and make recommendations for sound risk management strategies in order to assure that highest risk pollution problems receive optimum remediation. The breadth of ORD's contributions to environmental protection can be seen in the following examples of work done over the last year.

- **Particulate Matter** -- ORD's air quality research continues to expand knowledge on the effects of both coarse and fine particles in the air we breathe. For example, we have examined the factors affecting the amount of particles deposited deeply in the lungs, how effectively particles are cleared from lung airways, and the role of metals on particle surfaces in causing toxic effects. Emissions studies have described particle formation and content following combustion of different kinds of fuel oils. ORD's risk assessment of health effects from Particulate Matter (PM) helped provide the scientific basis for EPA's new PM standard which will undergo continued scientific research through July 2002 as described in the President's July 1997 implementation memo. In addition, we are revising our Draft Particulate Matter Research Program Strategy pending receipt of comments and recommendations from the National Academy of Sciences this month.

- **Harmful Algal Blooms** -- An outbreak of the algae *Pfiesteria* is suspected to have caused substantial fish kills in the Chesapeake Bay and may have also affected exposed swimmers and fishermen. Algal blooms have cost fishing industries millions of dollars over the past decade and caused outbreaks of

illness around the U.S. such as neurotoxic shellfish poisoning in North Carolina, and amnesiac shellfish poisoning in Washington State and Oregon. In response to this growing problem, ORD has assumed a key role in developing a national research and monitoring strategy and recently hosted an algal bloom workshop in Pensacola, Florida. ORD's research includes studies on *Pfiesteria*-induced learning and memory problems, causes of Chesapeake Bay fish kills, and laboratory evaluation of algal toxin effects on aquatic organisms. Further, we are working with NOAA, NSF and the Office of Naval Research on the ecology and oceanography of harmful algal blooms and have jointly awarded $3 million in competitive grants to outside researchers to study the issue.

- **Endocrine Disrupting Compounds** -- ORD's health effects studies have revealed that not only can chemicals affect female reproductive hormones (such as estrogen), but some chemicals can also interfere with male hormones (androgens). Other studies suggest that PCBs may cause adverse effects to the nervous system by interfering with thyroid hormones. In 1997 we presented key scientific findings on the topic in our "Special Report on Environmental Endocrine Disruption: an Effects Assessment and Analysis." Further, ORD chairs the White House's Office of Science and Technology Policy's (OSTP) workgroup on endocrine disruptors, coordinates federal research on the subject, and developed an inventory of endocrine disruption research across the government. Our peer-reviewed Research Plan for Endocrine Disruptors is final and in press.

- **Mid-Atlantic Integrated Assessment (MAIA)** -- Led by ORD's Environmental Monitoring and Assessment Program (EMAP), a multi-agency scientific team sampled the waters of the Chesapeake Bay, Delaware Estuary, Albemarle-Pamlico Sound and Delmarva Coastal Bays last summer to evaluate the vitality of native fisheries, wildlife, and recreational resources. The team is studying water temperature, salinity, dissolved oxygen and nutrients, as well as sediment chemistry, toxicity, and bottom-dwelling organisms. The MAIA report, which will guide decision makers in protecting these important estuaries, is due out this Spring. In 1997, the team produced reports on pesticides in groundwater and surface water of the Mid-Atlantic region.

- **Ecological Risk Assessment Guidelines and Neurotoxicity Risk Assessment Guidelines** -- ORD has completed final guidelines for conducting ecological risk assessments, and for conducting neurotoxicity risk assessments to better describe the risk assessment process and foster consistency across the Agency when planning and conducting risk assessments. The Ecological Risk Assessment Guidelines describe problem formulation, information analysis, and risk characterization, then provide program-specific examples applying the principles to activities such as hazardous waste remediation, new chemical and pesticide registration, and watershed management. The Neurotoxicity Guidelines guide Agency evaluations of chemicals suspected to cause adverse effects on the nervous systems of human beings, and emphasize the need to conduct risk assessments on a case-by-case basis. The guidelines also discuss the special vulnerability of the nervous systems of children and infants. The guidelines are awaiting final agency approval.

- **Mercury Study - Report to Congress** -- In December 1997, EPA released its eight volume Mercury Report, as mandated by the Clean Air Act Amendments of 1990. The Report evaluates the human health and environmental impacts of mercury emissions to the air resulting from human activity. The Report also evaluates technologies and costs for controlling mercury emissions. Exposure to mercury is of particular concern because it accumulates in the environment and enters the "food web." Consumption of methyl mercury-contaminated fish is the pathway of concern. The Report was a multi-year effort involving scientists across the Agency, for which ORD provided innovative models to examine atmospheric and water transport, bioaccumulation, exposure, and adverse health effects of mercury.

- **Protecting Drinking Water** -- Despite the dramatic improvement in the Nation's water quality, contaminated source water and inadequate treatment still pose risks to human health. At the same time, use of chlorine or alternative disinfectants in drinking water can produce a variety of by-products that may pose risks of cancer and other health effects. ORD research has contributed substantially to understanding and managing these risks and provides the foundation for future EPA research and regulatory efforts. Our work includes studies of infectious doses of *Cryptosporidium*, the cancer risk associated with several disinfection by-products such as

dichloroacetic acid, use of biofilters following ozone disinfection, and low-cost treatment technologies for small scale drinking water facilities. Our Research Plan for Microbial Pathogens and Disinfection By-Products in Drinking Water was finalized in December 1997 and our Plan for Arsenic in Drinking Water was finalized last month.

- **Environmental Technology Verification (ETV)** -- This program seeks to verify the environmental performance characteristics of commercial-ready technologies through the evaluation of objective and quality assured data. This verification provides purchasers with an independent and credible assessment of what they are buying and permitting. ORD's ETV program has formed partnerships with ten public and private testing organizations and now has nine pilots in operation. Over 200 State, Federal and industry stakeholders assist us in setting priorities and designing test protocols in these pilots. Twelve technologies have been verified to date and 24 others are now being tested. ORD expects to be able to verify the performance of up to 300 innovative technologies within ten years.

- **Global Climate Change** -- Global climate change is a topic of growing concern to a wide variety of scientists, most of whom believe that we are now beginning to see the effects of excess green house gas emissions in our biosphere. Until recently, the U. S. Global Change Research Program has focused on observing, evaluating, and documenting change in the Earth's physical systems. It is now appropriately shifting to a much broader effort to understand what global change means for the Earth's biological systems and for human society. In cooperation with the OSTP, ORD's Global Change Program is sponsoring a series of regional workshops to examine vulnerabilities to climate change and variabilities unique to each area. Of particular importance is understanding the "regional mosaic" of the consequences of climate change. ORD also has completed mapping and imagery of North America using the North American Landscape Characterization program so that we have a baseline of landscape patterns to see how these patterns are changing and if can we link change to a particular cause like climate change. We have also done extensive work in the area of UV-B radiation effects on crop yields and the effects of ultra-violet radiation on the human immune system.

- **Superfund Innovative Technology Evaluation (SITE) Program** -- ORD has made considerable progress in stimulating the use of innovative treatment technologies in the cleanup of hazardous waste sites. The program emphasizes lower cost technologies such as in situ bioremediation and electrokinetics (using electricity to herd contaminants through groundwater or soil for collection and treatment). Many of the vendors participating in the SITE program attribute a part of their success to the effectiveness of the program in providing accurate cost and performance data for those making cleanup decisions. Cost savings associated with the use of these technologies at hazardous waste sites (during the period 1993-5), exceeded $1.4 billion dollars, and we expect the 1997 tabulation of savings to be equally impressive.

ORD plans to have completed a total of 10 research plans and strategies by the end of this year. Plans for our high priority research areas include: 1) Microbes and Disinfection By-Products in Drinking Water (completed), 2) Particulate Matter, 3) Arsenic in Drinking Water (completed), 4) Endocrine Disruptors (final), 5) Pollution Prevention, 6) Ecosystems Protection, 7) Human Health Risk Assessment, 8) Global Change, 9) EMAP, and 10) Waste Research. Attached is a list of other research planning in which ORD plays a key role. All of ORD's research plans and strategies are posted on ORD's Home Page on the World Wide Web.

ORD'S PLANNING AND BUDGETING PROCESS

ORD's planning process is described in our Strategic Plan for Research, where we state our mission to provide the scientific foundation for Agency decisions by:

- Conducting *research and development* on current and future environmental problems,

- Providing responsive *technical support* to EPA's programs and Regions,

- *Collaborating with scientific partners* in academia, other Agencies, other Nations, and the private sector, and

- *Exercising leadership* in emerging environmental issues and in advancing risk assessment and risk management.

ORD's research planning and prioritization activities cascade from the Agency's Strategic Planning activities as outlined in EPA's GPRA goals and objectives. The resulting research plans and strategies are shaped by outside peer advice from groups such as EPA's Science Advisory Board, the Board of Scientific Counselors and the National Research Council (NRC), and then refined to meet the needs of EPA Program Offices and Regions and our Federal research partners.

Accordingly, ORD has designed a science program that identifies and enables research on the highest priority environmental problems where EPA can make a difference. It improves understanding of emerging environmental risks and develops innovative approaches to reduce those risks. It also promotes near and long term decision-making based on the use of the best available science and data, while fostering partnerships with a variety of stakeholders. Finally, it fully integrates ORD's research planning with GPRA and EPA accountability systems, about which I testified before you in 1996.

EPA'S FY 1999 SCIENCE AND TECHNOLOGY BUDGET

The Agency's total FY 99 request in the Science and Technology (S&T) Account is $**633.5** million and **2428** total work years, an increase of $2.5 million and 68.6 work years over FY 98. The S&T account, created in 1996, funds the operating programs of the Office of Research and Development, the Office of Air and Radiations's Office of Mobile Sources, and the Program Office laboratories. These organizations provide significant scientific and technical expertise in meeting the Agency's broad array of environmental goals. Thus, the S&T account allows the Agency to utilize a variety of skills and expertise, regardless of their organizational location.

ORD's total FY 99 request is $**527.3** million and **1976** work years, including 50 new post doctoral scientists and engineer research positions. Of this total, ORD's FY 99 request in the S&T account is $**485.5** million and **1849** work years. The remaining $41.8 million and 127 work years are in accounts other than the S&T account to support the Superfund, Leaking Underground Storage Tank, and Oil Spills research programs.

ORD's budget planning for 1998 was built on the strategic principles and priorities articulated in the ORD Strategic Plan. Our FY 1999 planning process has been further aligned with EPA's Strategic Plan and the Agency goals identified under GPRA. Our budget for FY 1999 is also responsive to the NRC's recently released report, "Building a Foundation for Sound Environmental Decisions" which stresses the importance of strong **core science capability** balanced with **problem-oriented research**. Our core research involves improving the underlying science of the environment and human health relevant to EPA's mission. Core research involves systematically acquiring understanding about environmental processes, developing broadly applicable research tools, and carrying out environmental monitoring programs. This research, which entails a long-term financial and scientific commitment, includes our work on ecosystem protection, human health risk assessment, and pollution prevention/new technologies. Our problem-driven research is targeted at understanding and solving identified environmental problems with high risk and uncertainty. Our work in this area includes high priority air pollutants (e.g. PM), safe drinking water (e.g. microbial disinfection by-products), and emerging environmental issues (e.g. endocrine disrupting compounds). These are prioritized in accordance with our Risk Assessment/Risk Management paradigm.

Our FY 1999 Budget Request is fiscally responsible, and reflects government's movement toward increasingly efficient operations. ORD has resources in nearly all of the Agency's GPRA goals, and we have the lead for Agency Goal 8 - Sound Science. I would like to briefly highlight for you ORD's planned research contributions to each of these goals.

- Goal 1- Clean Air: **Particulate Matter Research** will (1) "address the importance of developing a better understanding of the effects of fine particles on human health, including their causes and mechanisms, as well as the species and sources of PM; (2) have determined, by July 2002, based on data available from its review, whether to revise or maintain the standards; and (3) coordinate research on health effects, biological mechanism causing effects, monitoring, source-receptor relationships, speciation of PM, identification of sources, control technologies and regional transport for particulate matter. ORD will continue to work in air toxics and tropospheric ozone.

- Goal 2 - Clean & Safe Water: **Drinking Water Research** will support Safe Drinking Water Act priorities emphasizing research on sensitive subpopulations; adverse reproductive effects of drinking water contaminants; research on selected drinking water disinfection by-products and arsenic; and waterborne disease occurrence studies. In addition, research will focus on treatment and maintenance of water quality in distribution systems, and on developing methods to measure the quality of bathing beach waters and communicate risk associated with beach use.

- Goal 3 - Safe Food: (Covered under Goal 8 - Sound Science)

- Goal 4 - Safe Communities: **Indoor Air Research** will produce necessary scientific information to understand indoor air effects. Research will further identify, characterize, and compare the health risks associated with indoor exposures to air pollutants so that risk managers can make informed decisions to protect public health.

- Goal 5 - Safe Waste Management: **The Superfund Innovative Technology Evaluation (SITE) Program** will continue to demonstrate the commercially available technologies for characterizing contaminants in subsurface and groundwater environments. SITE also will demonstrate full-scale innovative treatment technologies that address a variety of remediation problems. This work will address one of the most complex, difficult, and costly aspects of the Superfund and Hazardous Waste management programs.

- Goal 6 - Reducing Global and Transboundary Environmental Risks: **Global Change Research** reflects the Agency's emphasis on a national assessment of the consequences of climate change. Research was reorganized in FY 1998 to reflect the emphasis on national assessments, and efforts in 1999 will continue to support this emphasis. The new focus will be reflected in increased efforts in the indicators of global change, research in ecosystem services (e.g. flood water mitigation, renewal of soil fertility), and regional-scale assessments in the Mid-Atlantic, Upper Great Lakes, and Gulf Coast regions.

- Goal 7 - Empowering People/Right to Know: The **Integrated Risk Information System (IRIS)** is a national database of health risk assessments. IRIS values represent Agency consensus on the health effects of hundreds of environmental contaminants, and, as such, are used across the Agency as the scientific basis for addressing various statutory mandates. In 1999, IRIS will be upgraded to improve its accessibility, outreach to users. In addition, our program for **Environmental Monitoring for Public Access and Community Tracking (EMPACT)** will improve the ability of communities to provide meaningful information to their citizens, on a real-time basis, regarding local environmental conditions in at least 75 of the largest U.S. metropolitan cities. Future efforts will focus on integrating various levels and types of environmental monitoring to allow for comparisons among and aggregations of community monitoring activities.

- Goal 8 - Sound Science: The majority of ORD's research investments in Sound Science are arrayed across the following four GPRA objectives:

  --**Ecosystem Protection Research**. Resources will be deployed to: (1) Ecosystem Assessment focusing on contaminants occurring simultaneously in more than one environmental media, (2) EMAP activities for environmental modeling using multiple time and geographic scales and multiple ecological stressors to better understand ecosystems sustainability, and (3) State-EPA partnerships for achieving a uniform national laboratory accreditation program.

  --**Human Health Risk Assessment Research**. Under this objective research will improve the identification and evaluation of human health effects (cancer and noncancer) and improve the description of dose-response relationships for selected pollutants like dioxin. We will improve ways to characterize and quantify impacts to sensitive subpopulations like children and the elderly and perform studies on the increased sensitivity of infants and children to certain environmental pollutants. Further, we are increasing our investment in post-doctoral scientists and engineers who will enhance our intramural research program, and strengthen America's cadre of environmental researchers.

--**Emerging Risk Research**. In addition to research efforts to identify, characterize, and evaluate risks of endocrine disrupting chemicals that adversely affect humans, we are also increasing efforts to develop risk management tools for certain endocrine Disruptors. Further, our One Atmosphere research will focus on multi-pollutant risks from air pollution. Our Exploratory Grants program will help design and generate new ideas and produce new scientific information by encouraging creativity and innovation in scientific research outside of the Agency.

--**Pollution Prevention Tools and Methodologies**. ORD's increased support for the Agency's Advanced Measurement Initiative (AMI) will foster working partnerships with technology developers to leverage the investments of other agencies and accelerate the application of new measurement and monitoring technologies. Investments in our STAR program will also support research and development of new and promising monitoring technologies to enhance environmental protection. Further, research will be directed to Persistent, Bioaccumulative and Toxic Pollutants (e.g. DDT) some of which cause adverse health effects in unborn children and sensitive populations, such as the urban poor, tribes and certain ethnic groups.

Finally, we are pleased to note that the President's budget request includes $32 million to complete construction of ORD's new state-of-the-art science and research facility at Research Triangle Park, North Carolina.

ORD's FY 1999 Budget Request reflects a clear, orderly research planning and prioritization process, scientifically sound peer-reviewed Research Strategies and Plans, and intensive cross-government coordination. Most importantly it is structured to meet the requirements of the Government Performance and Results Act and is focused on achieving results.

ORD'S RESEARCH GRANT PROGRAM

ORD created its extramural Science to Achieve Results (STAR) program to complement its in-house scientifics expertise and support environmental research by leading scientists outside the agency. Our STAR program is in its fourth year of providing grants to scientist in universities and not-for-profit organizations and

fellowships to promising young graduate students in environmental science. A typical grant under the STAR program lasts three years and provides on average $150,000 - $200,000 of scientific support per grant year. In 1997 we awarded 173 research grants (worth $81 million over three years) to 109 institutions in 44 states, Guam, and the District of Columbia. Also under the STAR program we awarded 116 new graduate fellowships, averaging $30,000 per year to the student and institution. This brings the total STAR program awards for the past three years to 540 grants and 359 fellowships. This year we are requesting $100 million for STAR grants and $10 million for STAR fellowships.

The STAR program is integral to our research, having been coordinated and planned with EPA Program and Regional offices. Grants are carefully aligned with the ORD Strategic Plan and our topic-specific Research Plans, and Requests for Applications (RFAs) are targeted to high priority science needs. The program is leveraged by the participation of other Federal agencies and private sector organizations with similar research needs, and rigorous external peer review assures the highest quality science products.

CONCLUSION

In closing today, I would like to reiterate that through its reorganization and reinvention initiatives, ORD has become a more dynamic and responsive scientific organization. It has made remarkable progress in focussing its research planning and prioritization activities to assure maximum utility to our internal and external customers. As the Agency's strategic planning has become more results and outcome oriented, so has ORD's research and science support. These transitional times are always challenging, but they are also the times of greatest program evolution and modernization. ORD has stepped up to that challenge and is delivering high quality, relevant, and timely science to support the Agency's environmental protection mandate. Thank you for inviting me to speak with you today.

ORD RESEARCH PLANS AND STRATEGIES

(Scheduled for Completion 1998)

1. Microbial Pathogens and Disinfection By-Products in Drinking Water (completed)
2. Particulate Matter
3. Arsenic in Drinking Water (completed)
4. Endocrine Disruptors (completed
5. Pollution Prevention
6. Ecosystem Protection
7. Global Change
8. Human Health Risk Assessment
9. Environmental Monitoring and Assessment Program
10. Waste Research

OTHER FEDERAL RESEARCH PLANS IN WHICH ORD PLAYS A KEY ROLE

1. Risks to Children (EPA)
2. Oxygenates in Water (EPA)
3. Harmful Algal Blooms (Multi-Agency)
4. Indoor Environmental Research Needs (EPA)
5. Mercury (EPA)
6. Beach Health Plan (EPA)