Testimony
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Prioritizing Chemicals for Safety Determination

Statement of

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Good morning Mr. Chairman and Members of the Subcommittee.

My name is Dr. Eric Sampson. Thank you for the opportunity to testify concerning uses of biomonitoring in setting public health priorities related to chemical exposure. It has been my pleasure to serve for the last 25 years as the Director of the Division of Laboratory Sciences of the National Center for Environmental Health at the Centers for Disease Control and Prevention (CDC). During that time, our biomonitoring program has grown into the mature discipline of science that I will discuss today. My testimony will focus on the biomonitoring program at CDC, and public health uses of biomonitoring.

CDC's Biomonitoring Program

Biomonitoring, as we define it, is the science of directly measuring chemicals in samples from people. Although the samples can be any tissue, we mostly use blood and urine. It is important to clearly differentiate biomonitoring from other important measurements conducted in environmental samples, such as air, soil, water, and food, and consumer products. Biomonitoring measurements have the advantage of indicating the amount of a chemical that actually gets into people, rather than extrapolating from measurements of environmental media. In addition, biomonitoring data tell us the amount of a chemical from all sources combined (e.g., air, soil, water, dust, food). Although biomonitoring is far ahead of the science of interpreting what exposures mean for health, biomonitoring data is valuable for a variety of public health purposes, such as identifying relative

levels of exposure in the population, particularly in children or other vulnerable groups, and setting priorities for research into the health impacts of chemicals.

Because CDC analyzes samples from people, we must deal with a host of considerations that may not arise in analysis of environmental samples. For example, we adhere to a human subjects review of all data collection protocols, as well as adherence to strict, statutorily required commitments to protect the subject confidentiality, as well as the good laboratory practice standards under the Clinical Laboratory Improvement Act (CLIA). CDC has highly-trained scientists who can assist on everything from sample collection and analysis to the interpretation of results. Almost all of our analytic measurements are conducted using an advanced technology, known as isotope dilution/mass spectrometry, which we consider the definitive, state-of-the-art method of measuring any chemical in blood and urine specimens.

We work hard to produce accurate and precise laboratory measurements. We study the best way to measure a chemical of interest, such as how the chemical is metabolized in the body, and how to avoid environmental contamination, which might affect our results. We are aware that biomonitoring "personalizes" exposure to chemicals and can lead to a high level of interest and concern regarding exposures. I will address three aspects of CDC's biomonitoring program: how we assess the U.S. population's exposure to chemicals; targeted

studies to examine vulnerable populations; and support of state biomonitoring programs.

How we assess the U.S. population's exposure to chemicals: Our laboratory measures chemicals or their metabolites in blood and urine samples from participants in the National Health and Nutrition Examination Survey (NHANES). NHANES, which is conducted by CDC's National Center for Health Statistics, involves a complete physical exam, a detailed questionnaire that collects more than 1,000 pieces of information, and the collection of blood and urine samples. The survey has been conducted multiple times since the 1970s and became a continuous survey in 1999 with two-year survey cycles. Although NHANES is nationally representative of the U.S. population, it offers limited exposure information on young children, mostly due to the difficulty in obtaining a large enough blood and urine sample from young children. Currently lead, cadmium, and mercury are measured in children aged 1 year and older, and cotinine, which is a marker for environmental tobacco smoke exposure, is measured in children aged 3 years and older.

Biomonitoring data from NHANES are included in the data files made publicly available in a form that does not permit the identification of individuals or their communities. In addition, CDC staff publishes findings in peer-reviewed publications, and then periodically publishes a summary report, the National Report on Human Exposure to Environmental Chemicals. The NHANES results,

as reported in each National Exposure Report, provide a snapshot of the U.S. population, identifying the amounts of selected chemicals that get into Americans' bodies. We plan to publish the Fourth Report by the end of 2009. Chemicals analyzed from the NHANES samples and reported in the Fourth Report were selected based on known or hypothesized exposure in the U.S. population; scientific data on the health effects known or thought to result from some levels of exposure; the need to assess the efficacy of public health actions to reduce exposure to a chemical with known health effects; the availability of an analytical method that is accurate, precise, sensitive, and specific; the availability of adequate blood or urine samples from the NHANES survey; and the analytical cost to perform the analysis. The choice of chemical analyses performed is also a function of requests or suggestions from other government agencies, who sometimes pay for those analyses. The Fourth Report will include data on 212 chemicals measured, including industrial chemicals, pesticides, flame retardants, a chemical related to tobacco use, combustion and disinfection by-products, and plasticizers.

Targeted studies: Each year we partner with states, other federal agencies, academic institutions and international organizations on 50-70 studies that examine vulnerable populations, particularly newborns, children, pregnant women and population groups or communities known or likely to have higher exposures. For example, one important current partnership is with the Eunice Kennedy Shriver National Institute of Child Health and Human Development at

the National Institutes of Health. This partnership involves the National Children's Study, which is designed to follow 100,000 children from conception to age 21. Our laboratory is collaborating on a pilot study of 525 pregnant women. We will measure chemicals in pregnant women's blood and urine and, after delivery, in the newborn's cord blood and mother's breast milk. Cord blood is a promising way to assess prenatal exposure to certain chemicals. However, cord blood is not the best way to measure exposures to chemicals that pass through the body more quickly; these generally are best measured in urine.

Support of state biomonitoring programs: State public health officials recognize the value of biomonitoring and of CDC's analysis of the samples from NHANES that are presented in the National Exposure Report. Many states are interested in conducting biomonitoring among residents within their own jurisdictions, and comparing their results with the national data published by CDC. In fiscal year 2009, CDC awarded a total of $5 million to three states -- California, New York and Washington -- for state-based biomonitoring programs. In addition, many states already have some capacity for biomonitoring because the same technology is used in emergency preparedness and response for chemical terrorism, which CDC funds through the Public Health Emergency Preparedness cooperative agreement. Forty-seven states received funding for instrumentation as well as training for detecting a limited number of chemicals in people. Finally, CDC's Environmental Public Health Tracking Program funds some state targeted

biomonitoring activities through their state tracking cooperative agreement program.

Public Health Uses of Biomonitoring

Biomonitoring offers a strong basis for prioritizing public health attention to certain chemicals. We use it to establish reference ranges in the population and to identify groups of people with higher levels of exposure than those typical for the U.S. population. In addition, by tracking exposures in the U.S. population we can detect trends in people over time, and assess whether a chemical is present in large numbers of people, or is disproportionately present in vulnerable subgroups, such as children. This information can be used by scientists and policy makers as one of the considerations in setting priorities for evaluating health impacts of chemicals.

A National Research Council review of biomonitoring noted that it has been a key tool in some landmark public health actions (NRC, 2006). One example is lead. Our laboratory has been measuring lead in the NHANES blood samples since 1976. Lead poisoning can affect nearly every system in the body. It can cause learning disabilities, behavioral problems, and at very high levels, seizures, coma and even death. Our laboratory analysis of the NHANES samples, which showed that the American population's blood lead levels were declining in parallel with declining levels of lead in gasoline, provided an impetus for the Environmental Protection Agency (EPA) regulations that reduced lead in gasoline

(GAO, 2000). CDC and EPA have used this decline in blood lead levels over time to demonstrate that the removal of lead from gasoline had a dramatic impact on the levels of lead in the U.S. population. Today, the most common source of children's exposure to lead is dust from older homes that contain lead-based paint. In the late 1970s, CDC used the NHANES data to document that 88 percent of children had blood lead levels above the current level of concern. We collaborate with CDC's Lead Poisoning Prevention Program, and our data demonstrate that public health efforts are working to reduce children's exposure to lead. The most recent NHANES data, from 1999-2004, show that 1.4% of children aged 1 to 5 years have elevated blood lead levels.

Biomonitoring also can be used to monitor the effectiveness of interventions designed to reduce exposures. In the early 1990s, our laboratory analysis of data from NHANES showed that 88 percent of the nonsmoking population was exposed to tobacco smoke. This finding was used by State and local areas as a justification for restricting smoking in public places. Over the past 15 years we have collaborated with CDC's Office on Smoking and Health, and NHANES data have shown that exposure to secondhand smoke in nonsmokers has decreased about 70 percent, indicating that public health interventions to reduce exposure have been successful.

And finally, another benefit of biomonitoring data is transparency. When used as a decision tool, it provides the public with valuable information about exposures.

It also provides policy makers and regulators with accurate human exposure information on which to base their decisions.

Conclusion

CDC recognizes that biomonitoring is one important tool for helping to prioritize chemicals of concern. Biomonitoring fills a major gap in human exposure information that allows us to better identify and prevent health problems. Better exposure information means that we can make better decisions to protect our health. We are fully committed to working with other federal agencies and partners to improve the uses and benefits of biomonitoring.

Thank you Chairman Rush and members of the Subcommittee. I look forward to answering any questions you might have.

References

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