

**TESTIMONY OF
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**BEFORE THE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE**

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Madam Chairman, Ranking Member Inhofe, and Members of the Committee, thank you for the opportunity to testify about the latest science on lead's impact on children's development and public health.

My name is John Vandenberg, and I am the Director of the Research Triangle Park, North Carolina Division of EPA's National Center for Environmental Assessment in the Office of Research and Development. My division is responsible for identifying and evaluating the world's scientific literature to create the Integrated Science Assessment (which I will refer to as the "ISA") that serves as the scientific foundation for decisions by the EPA Administrator on retaining or revising the National Ambient Air Quality Standards for Lead. My testimony today will include a brief review of data on the trends of lead in the air and in human blood, and the draft conclusions regarding the health effects of exposure to lead that EPA has developed in the most recent draft ISA for Lead.

Lead is one of six pollutants for which a National Ambient Air Quality Standard (referred to as "NAAQS") has been established under the Clean Air Act. Emissions of lead to the air

historically resulted from the use of lead additives in gasoline. Following the phase-out of lead additives for on-road gasoline and tightened industrial standards, emissions of lead to ambient air have declined by more than two orders of magnitude over the period 1970 to 2008. Ambient air concentrations of lead have shown a similar dramatic decline as have levels of lead in the blood of children and adults.

In 2008 the NAAQS for lead was strengthened; the level of the standard was lowered from the 1978 level of $1.5 \mu\text{g}/\text{m}^3$ to a level of $0.15 \mu\text{g}/\text{m}^3$ (a ten-fold reduction). EPA's decision on the standard was based on the much-expanded health effects evidence for the effects of lead on learning in children. The revised standard was established to protect against Pb-related health effects, including IQ loss, in children.

The current review of the air quality criteria for lead was initiated in February of 2010 with a call for information and subsequent development of a draft ISA for Lead. The Integrated Science Assessment is a synthesis and evaluation of the most policy-relevant science that forms the scientific foundation for the review of the NAAQS for Lead. The second draft of this assessment was released for public comment and for review by the Clean Air Scientific Advisory Committee, or CASAC, an independent panel of experts, in February 2012. The CASAC Lead Panel reviewed the second draft in April 2012 and we expect to receive final comments on this draft soon. Revisions based on CASAC and public comments will be incorporated into a third draft ISA, which is targeted for release in the fall of 2012, for public comment and peer review by the CASAC.

Over 2900 scientific studies were included in the second draft ISA, demonstrating the large body of evidence available on issues related to lead emissions, ambient concentrations, exposures, biomarkers, and health and environmental effects. In the latest draft of the Lead ISA the EPA's draft conclusions were that human exposure to lead involves multiple pathways including hand to mouth contact or inhalation of lead dust, eating peeling paint chips, drinking water conveyed through lead pipes, and exposure to soil, which can act as a reservoir for deposited lead emissions.

The second draft Lead ISA organizes, presents and integrates evidence that is generally consistent with the previous science assessment, completed in 2006. Based heavily on effects on learning and memory in children, the collective body of evidence presented in the science continues to provide support for a causal relationship between lead exposure and effects on the nervous system. Epidemiologic and toxicological evidence also demonstrate lead-associated increases in behavioral problems, in particular, inattention and impulsivity in children. The biological plausibility for epidemiologic and toxicological findings for effects on cognitive function and behavior is provided by evidence characterizing underlying mechanisms, including lead-induced effects on the developing nervous system. Of particular interest for lead is the shape of the concentration-response curve at the low end (<10 µg/dL) of current blood lead concentrations observed in the U.S. population. In addition to effects on learning and behavior, at very high levels, Pb poisoning can lead to seizures, coma, and even death.

Building on the strong body of evidence reviewed in the previous science assessment, recent epidemiologic and toxicological studies reviewed in the second draft science assessment

provides evidence of an association between long-term lead exposure and cardiovascular effects in adults. The largest body of evidence is for associations of lead with increased blood pressure and hypertension.

Other health effects are also reviewed in the second draft ISA. For example, the evidence consistently supports a relationship between lead and decreased kidney function in non-occupationally-exposed adults. The evidence also supports a potential association of blood lead levels with delayed onset of puberty in both males and females, detrimental effects on sperm and semen quality in occupationally-exposed males and, asthma and allergy-related immune effects in children. Recent epidemiologic and toxicological studies also support findings from the previous assessment that lead exposure in children and occupationally-exposed adults is associated with effects on developing red blood cells and constituents involved in oxygen binding and transport.

Many associations with red blood cell function, cardiovascular, renal, reproductive and developmental effects have been observed in populations with mean blood lead levels less than 10 µg/dL; however, there is uncertainty about the patterns of lead exposure contributing to the associations that we observe in populations of older children and adults who are likely to have had higher past than recent exposure.

Lead emissions to the air have declined substantially since 1970, with commensurate declines in the concentration of lead in the air and in human blood. A review of the scientific evidence related to the health and environmental effects of lead exposure is now underway, to inform

decisions by the EPA Administrator on the National Ambient Air Quality Standards for Lead. Collectively, the substantial body of evidence reviewed in the second draft ISA, and summarized above, highlights what we know about the relationship between lead exposure and effects on the nervous system, cardiovascular system, as well as red blood cell function. There is also evidence that lead exposure is associated with renal, immune, reproductive and developmental effects. Research suggests that many of these effects of lead, including effects on learning and memory are found in populations of young children at very low blood lead concentrations.

Thank you for the opportunity to testify before you today. I am happy to answer any questions you may have at this time.