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AIRBORNE LEAD REDUCTION ACT OF 1984

HEARING
BEFORE THE
COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
NINETY-EIGHTH CONGRESS

SECOND SESSION

ON

S. 2609

A BILL TO AMEND THE CLEAN AIR ACT WITH REGARD TO MOBILE
SOURCE EMISSION CONTROL

JUNE 22, 1984

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the age of two still show some, but not all, residual deficits 5 years later.

Other important effects newly demonstrated to be associated with lead exposures starting below 30 micrograms include inhibition of yet another red cell enzyme and, perhaps of greater pathological importance, interference in vitamin D metabolism.

The enzyme effect is observed in children at blood lead levels extending to below 10 micrograms per deciliter. There is a debate as to its medical significance, but there is no apparent threshold that's been discovered for the effect.

The inhibition of vitamin D metabolism demonstrated in children to be associated with blood lead levels extending down, again without apparent threshold, to as low as 12 to 15 micrograms of lead per deciliter in blood, is of particular concern because of the importance of vitamin D metabolism to the kidney, and in terms of growth and development in children.

There are some new findings as well coming out of the National Health and Nutrition Evaluation Survey, which Dr. Houk will discuss in much more detail. Some of these include the suggestion that there may be an association between elevations in adults' blood pressure and levels of blood lead.

Other new findings which were recently discussed in an EPA-sponsored international workshop on prospective studies of pediatric populations might also be mentioned here. They focused on major long-term studies in the United States and abroad concerning effects of lead on the fetus and during early childhood. Among the results reported at that meeting and just recently published were findings of some minor congenital anomalies in newborn infants being associated with umbilical blood lead levels averaging below 10 micrograms per deciliter. Dr. Needleman, who is on the panel, has presented these studies, and I am sure he will tell you more about them.

Let me conclude by pointing out that recent evaluations by other EPA offices of costs and benefits associated with further phase-down or total banning of lead in gasoline found net monetary benefits to be associated with decreasing gasoline lead usage. It is important to emphasize that those calculations included monetized estimates only of benefits expected for avoidance of health effects associated with blood lead levels above 30 micrograms per deciliter. If there were no effects at all below 30 micrograms per deciliter, the monetized levels in the EPA studies would still not change.

None of the new types of effects discussed here as being reported at blood lead levels of less than 30 micrograms were monetized, although they are of concern and, of course, provide additional support for reducing lead in gasoline.

Thank you. I will be happy to answer any questions.

Senator STAFFORD. Thank you very much, Doctor.

Since this Senator comes from the same neighborhood where Calvin Coolidge was born and grew up, we make anybody who concludes within their time limit an honorary Northern New Englander.

Dr. Houk, we would be very glad to hear from you.

STATEMENT OF DR. VERNON N. HOUK, DIRECTOR, CENTER FOR ENVIRONMENTAL HEALTH, CENTERS FOR DISEASE CONTROL, PUBLIC HEALTH SERVICE, ACCOMPANIED BY DR. JAMES PIRKLE

Dr. Houk. Thank you, Mr. Chairman, Senator Durenberger, and Senator Evans. I am Dr. Vernon Houk of the Centers for Disease Control, of the Public Health Service. I am pleased to be here today to discuss an issue that I have been deeply involved in since 1973. I have accompanying me Dr. James Pirkle of my staff, who has done much of the analysis.

Before I begin, I would like to make an aside. In some of the documents of recent days, the relationship between the Environmental Protection Agency and CDC on this issue has been described as "collusion." I would prefer to describe that relationship as two responsible public agencies working for the benefit of the health of the children of the United States.

One of the major advances in the last 10 years has been our improved understanding of the contribution of air lead to the multiple routes of human lead exposure. The three major population-wide sources of lead exposure in the United States are lead in gasoline, lead in paint, and lead in solder. These sources of lead use the pathways of air, water, food, paint chips, dust, and dirt to reach children and adults.

Gasoline lead, which leaves the tailpipe and is temporarily suspended in the air, accounts for about 85 percent of all of the air lead in the United States. Subsequently, it falls from the air onto the water, dust, food crops, and dirt, contaminating drinking water and the food chain. People are then exposed to gasoline lead by breathing, eating, and drinking, and especially children through the normal hand-to-mouth activity that transfers dust and dirt to their mouths.

Several recent studies have investigated the relationship between gasoline lead and blood lead. One nationwide study is the second national health and nutrition assessment survey, which was designed to represent the civilian noninstitutionalized population of the United States 6 months to 74 years of age.

From February 1976 through February 1980, mean blood lead levels in the United States dropped 37 percent, from 15 micrograms to 10 micrograms per deciliter. In addition, the blood lead levels were found to be higher in the summer as compared with the winter.

General exposure to lead in paint and soldered lead in cans changed very little during the survey period. However, lead in gasoline decreased approximately 50 percent over the 4 years of the survey, from 196,000 tons per year to 94,000 tons per year.

Appended at the back of my testimony is a chart, and you don't have to have very much statistical training to review it. Some commonsense will show you that association is very, very strong. It shows the lead used in gasoline and NHANES levels over this survey period.

Multiple regression analysis revealed that 50-percent decrease in leaded gasoline fully accounted for the 37-percent decline in blood lead levels. In addition, the seasonal fluctuations in blood lead

levels are explained by the seasonal fluctuation in lead gasoline usage. Seasonal fluctuations in blood lead levels have been noted previously, but this is the first time that they have ever been adequately explained.

So the gasoline lead-blood lead relationship that explained the overall 4-year decline in blood lead levels also explained the increase in blood lead levels that occurred from the winter to the summer months.

For children 6-month mean blood lead levels were highly correlated with 6-month mean gasoline lead levels. This high correlation did not appreciably change even after accounting for the effects of virtually every conceivable variable that could influence these results. The probability that chance could account for this relationship between blood lead levels and gasoline lead is less than one in 10,000.

The NHANES II blood lead level results also predicted the average length of time that a change in blood lead levels would lag behind the gasoline lead exposure by approximately 1 month. A similar value was determined independently by isotopic measurements.

In addition, the New York City and Chicago lead screening programs have measured the blood lead levels of a large number of children. Analysis of the blood lead levels of New York and Chicago children from 1970 to 1976 showed a strong association between gasoline lead and blood lead. Just as with the NHANES II data, the decline in blood lead levels are explained by gasoline lead usage and also explained the short-term seasonal fluctuations in blood lead.

Another study conducted by Dr. Needleman's group in Boston of umbilical cord blood lead levels between April 1979 and April 1981 showed a downward trend and the seasonal pattern of blood lead levels were found. Average monthly mean blood lead levels were strongly associated with the local monthly gasoline usage.

The implication of gasoline lead as a significant contributor to the umbilical cord blood lead levels is noteworthy, since the yet-unborn child is probably the most vulnerable to the neurotoxic effects of lead.

The NHANES II study, the New York City, the Chicago, and the Boston blood lead data are four large independent data sets, each demonstrating the same strong relationship between gasoline lead and children's blood lead levels. In each of these studies, gasoline lead usage not only explained long-term decreases in blood lead levels but simultaneously accounted for the short-term increases in blood lead levels that occur from winter to summer months.

The excellent agreement of these four independent studies strongly supports a causal relationship between changes in gasoline lead use and changes in blood lead.

In an effort to quantify the amount of lead in human blood which comes from gasoline, a large-scale field study was undertaken in Italy in 1974. The gasoline of an entire region in northern Italy was 90 percent replaced with gasoline which contained lead from a foreign source that could be isotopically traced. Gasoline lead was found to contribute at least 5 to 6 micrograms per deciliter to the blood lead levels.

Estimates from the NHANES II are that gasoline lead contributed approximately 8 micrograms per deciliter to the blood lead levels, which is in good agreement with the Italian experiment.

For a typical child in the United States, current gasoline lead exposure accounts for 25 to 50 percent of the total blood lead level. In pockets of excessive lead exposure from gasoline, this contribution is likely to be higher.

Calculations from CDC's lead screening program indicate that if no lead had been allowed in gasoline since 1977, there would have been approximately 80 percent fewer children identified with lead toxicity. That is, 80 percent of the children found to have lead toxicity required the contribution of both gasoline lead and nongasoline lead sources to reach the toxic effects.

Compounding the gasoline lead exposure problem is that the gasoline lead that is dispersed into the environment accumulates. General lead accumulation in our environment from all sources has already amassed to such a degree that the typical adult body burdens of lead in the United States are about 500 times higher than those persons who lived in our preindustrial era. Even though the amount of lead in gasoline has been reduced, as of the beginning of 1984, lead is still being dispersed into the United States environment at a rate of 53,000 tons per year, or 6.1 tons per hour, an unnecessary contamination of our environment by a very highly toxic material that has been demonstrated to have adverse effects on humans.

In summary, in spite of some other views which you may hear this morning—and I predict you will hear other views—evidence is overwhelming that the gasoline lead is a major controllable source of lead exposure. Eliminating lead in gasoline would not only immediately decrease the blood lead levels, but would also decrease the background lead levels for future generations.

Thank you very much.

Senator STAFFORD. Thank you very much, Doctor.

And now we would be pleased to hear from Dr. Needleman.

STATEMENT OF DR. HERBERT L. NEEDLEMAN, DIRECTOR, BEHAVIORAL SCIENCES DIVISION, CHILDREN'S HOSPITAL OF PITTSBURGH

Dr. NEEDLEMAN. Good morning, Mr. Chairman. I am Herbert L. Needleman. I am chief of psychiatry at the Children's Hospital of Pittsburgh. I am also a pediatrician, and I believe that I may be the only witness here today who has actually treated lead poisoning. So I speak about my research and the research of others from the vantage of somebody who has had to deal with the acute consequences of lead intoxication and the remedial education of children who are brain-damaged as a result of their exposure.

I want to congratulate this committee and Senator Durenberger for taking the leadership in what I think is one of the most important public health issues of the decade for American children.

I will not read my testimony because of time. I gather my assignment is to review in capsule form the health effects of lead at low dose. I will concentrate on the work of my group, but I don't want to convey that the burden of the evidence resides just with the