

Subcommittee on Commerce, Trade, and Consumer Protection

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Thank you for the opportunity to comment today on the safety of phthalates and bisphenol A in consumer products. My name is Ted Schettler. I am a physician. I received a medical degree from Case Western Reserve University and master's degree in public health from Harvard University. I have training in toxicology and epidemiology in addition to traditional medical sciences. I practiced medicine for over 30 years.

I have participated in an investigation of phthalate exposures in infants in intensive care units in two hospitals. I have published papers and monographs addressing phthalate exposures and toxicity. I am currently the Science Director of the Science and Environmental Health Network with an office in Ann Arbor, MI. This Network engages communities and governments in the effective application of science to protect and restore public and ecosystem health.

The chemicals being discussed today are in the bodies of virtually every American. They are in fetuses, infants, and children. Moreover, health impacts of these chemicals, as determined from animal testing and to a limited extent in humans, are among those that

are prominent in today's patterns of disease. Therefore, today's topics are of obvious public health concern.

First, I will comment on phthalates:

Phthalates are produced in large amounts and used in many consumer products, including, toys, construction materials, furnishings, appliances, medical devices, pharmaceuticals, insect repellants, pesticide formulations, adhesives, paints, inks, cosmetics, personal care products, air fresheners, and others. In general, phthalates are not tightly bound in these products, and people are exposed when they use them or from general environmental contamination.

Biomonitoring data from the Centers for Disease Control and Prevention (CDC), as well as a large number of epidemiologic studies, show that people in the general public are regularly and consistently exposed to mixtures of phthalates. This includes all age groups, including developing fetuses and infants. Some people are exposed at much higher levels than others.

Members of the phthalate family of chemicals have both similarities and differences in their chemical structures. As a result, their toxic properties vary to some degree.

Nevertheless, some phthalates have enough in common to cause toxic effects in laboratory animals and people through the same mode of action. This means that when

we estimate risks associated with phthalates, we need to consider exposures in the aggregate—not simply risks associated with single chemicals from single sources.

Animal testing shows that the developing fetus and infant are particularly sensitive to phthalates. Effects on the developing male reproductive tract have received considerable attention. Exposures to some phthalates in laboratory animals at critical times during the formation of the reproductive tract cause a variety of malformations, including hypospadias (a birth defect of the penis with increasing incidence in baby boys in birth defect registries in the US) , undescended testes, and reduced sperm counts.

Studies designed to elucidate how phthalates cause these abnormalities show that at least six members of the family, and possibly more, interfere with normal testosterone production. (DEHP, DBP, BBzP, DINP, DiBP, DPP) (Borch, 2004; Howdeshell, 2008) To some extent, the potency of these six phthalates varies with respect to their ability to interfere with testosterone production. But when studied in mixtures, their doses are additive.

This is a critical issue for public health protection. People are not exposed to single phthalates but rather to mixtures of these chemicals in the real world. It is essential to consider these exposures collectively when drawing conclusions about the risks associated with exposures to any particular phthalate or from any particular source.

Some people are exposed to single phthalates at levels that exceed safety thresholds as determined by regulatory agencies. In our study in two Boston hospitals, for example, we determined that some infants were exposed to DEHP from medical devices at levels in excess of FDA's tolerable intake. When exposures are considered in the aggregate, as they should be for a subset of these chemicals, the number of people with excessive exposures is much larger.

Reproductive toxicologists generally agree that the effects of phthalates in rodents and other test animals are relevant to people. Studies in humans are limited, although evidence of phthalate impacts in people at current exposure levels is beginning to accumulate. For example, a study of 134 baby boys found a correlation between maternal exposures to four different phthalates and altered genital development in their sons. (Swan, 2005) Phthalates are also linked to reduce sperm count or sperm quality in men studied in an infertility clinic. (Hauser, 2006)

Some phthalates do not interfere with testosterone production but nevertheless have toxic properties. DIDP, for example, causes birth defects and decreased survival and growth of offspring in laboratory animal testing. DIDP has historically been used in toys. (NTP-CERHR monograph)

Other health effects in people that have been linked to phthalates in building materials and household furnishings include asthma, other respiratory illnesses, and allergies.

(reviewed in Mendell, 2007) Animal studies also show that DEHP can boost the allergic response to other substances, often at very low levels of exposure.

I will conclude with a few comments about bisphenol A.

First, studies from the CDC show that exposure to bisphenol A is widespread in the general population. Ninety-three percent of people in the representative study population had detectable levels of bisphenol A in their urine. Levels were higher in children than adults. People are exposed to bisphenol A primarily through their diet. Bisphenol A can migrate into food and beverages from the lining of food cans or from polycarbonate plastic containers made from bisphenol A. Skin absorption and inhalation may be also be significant exposure pathways that are not well quantified.

Second, in addition to the biologically inactive metabolite of bisphenol A, the active form of the chemical bisphenol A is also regularly detectable in people. The active form is also present in umbilical cord blood of newborn infants showing unequivocally that fetuses are exposed to that form of bisphenol A in the womb. (Schonfelder; reviewed in Vandenberg; NTP-CERHR)

Third, fetuses and infants have markedly reduced capacity to transform the active form of bisphenol A into the inactive form that is excreted in the urine. (NTP-CERHR; Taylor, 2008) This means that fetuses and infants are at particular risk of prolonged exposure to the active form of bisphenol A.

Fourth, bisphenol A has estrogen-like properties and can also disrupt thyroid hormone status. Based on a large scientific database, committees convened by the National Toxicology Program, the National Institute of Environmental Health Sciences, and other experts have enumerated a number of health concerns associated with bisphenol A, although lack of consensus about how to interpret the data as a whole persists. Health effects that have been described include neurobehavioral changes, impacts on reproductive system development and function, abnormal numbers of chromosomes in dividing cells, predisposition to cancer, and insulin resistance as is seen in diabetes. In laboratory animal tests, some of these effects occur with low-level exposures, similar to those in people in the general population. I want to comment from a medical and public health perspective on just two of these.

Animal testing shows that low-level bisphenol A exposures during fetal development or infancy modify the development of the prostate gland and breast, permanently altering their tissue architecture. (Prins, 2008; Timms, 2005; Durando, 2007) Moreover, these architectural changes predispose the prostate and breast tissue to later disease, including cancer. In some cases, these changes are themselves pre-cancerous. These abnormalities occur in animal studies at levels of exposure similar to those to which people in the general public are now exposed.

From a public health perspective, this is a serious concern. If the same tissue alterations occur in people, and the presumption should be that they do unless shown otherwise, we

are faced with a troubling reality. Virtually all fetuses and infants in the US are exposed to a chemical at levels that may increase the risk of prostate or breast cancer years later.

Today's pattern of diseases and disabilities prominently includes prostate and breast cancer, diabetes, early onset of puberty in girls, behavioral abnormalities in children, infertility, and birth defects of the reproductive tract, including hypospadias. Scientific studies, designed in various ways, have linked each of these conditions to phthalate or bisphenol A exposures, although there are differing interpretations of some portions of the scientific database. It is, however, undeniable that virtually all Americans are exposed to phthalates and bisphenol A.

I urge you to think about this from a public health perspective and ask what amount or strength of evidence we should require before taking action to reduce or eliminate exposures to these chemicals, particularly in vulnerable populations. That is a public policy decision, which should be informed by good science, and also by values and common sense. Do we wait for irrefutable proof of harm in people before taking action? Who decides?

The limits of epidemiological research will always make it difficult to tease out some cause and effect relationships, even when they exist. It is particularly difficult when the entire population is already exposed to chemicals of concern. But policy makers need to decide when evidence is sufficient to act, even in the face of scientific uncertainty.

Otherwise, we miss opportunities for primary prevention of avoidable disease and disability.

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