MEETING

STATE OF CALIFORNIA

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

ENVIRONMENTAL CONTAMINANT BIOMONITORING PROGRAM

SCIENTIFIC GUIDANCE PANEL

ELIHU HARRIS STATE BUILDING

ROOM 1, SECOND FLOOR

1515 CLAY STREET

OAKLAND, CALIFORNIA

THURSDAY, APRIL 11, 2013

9:47 A.M.

JAMES F. PETERS, CSR, RPR
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A P P E A R A N C E S

PANEL MEMBERS:

Ulrike Luderer, Chairperson, M.D., Ph.D.

Asa Bradman, M.S., Ph.D.

Carl Cranor, Ph.D., M.S.L

Marion Kavanaugh-Lynch, M.D., M.P.H.

Thomas McKone, Ph.D.

Julia Quint, Ph.D.

Michael P. Wilson, Ph.D., M.P.H.

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT:

Dr. George Alexeeff, Director

Dr. Lauren Zeise, Deputy Director, Scientific Affairs

Ms. Amy Dunn, Safer Alternative Assessment and Biomonitoring Section

Ms. Sara Hoover, Chief, Safer Alternatives Assessment and Biomonitoring Section

Ms. Fran Kammerer, Staff Counsel

Dr. Gail Krowech, Staff Toxicologist, Safer Alternatives Assessment and Biomonitoring Section

Dr. Laurel Plummer, Associate Toxicologist, Safer Alternatives Assessment and Biomonitoring Section

DEPARTMENT OF PUBLIC HEALTH:

Dr. Michael J. DiBartolomeis, Chief, Exposure Assessment Section, Environmental Health Investigations Branch

Dr. Michael Lipsett, Chief, Environmental Health Investigations Branch

A P P E A R A N C E S C O N T I N U E D

DEPARTMENT OF PUBLIC HEALTH:

Dr. Laura Fenster, Research Scientist, Environmental Health Investigations Branch

Ms. Lauren Joe, Research Scientist, Environmental Health Investigations Branch

Dr. Sandra McNeel, Research Scientist, Environmental Health Investigations Branch

Dr. Jianwen She, Chief, Biochemistry Section, Environmental Health Laboratory

DEPARTMENT OF TOXIC SUBSTANCES CONTROL:

Dr. Myrto Petreas, Chief, Environmental Chemistry Branch

ALSO PRESENT:

Mr. Davis Baltz, Commonweal

Ms. Nancy Buermeyer, Breast Cancer Fund

Dr. Diana Graham, Keller & Heckman

Ms. Renée Sharp, Environmental Working Group

I N D E X

I N D E X C O N T I N U E D

P R O C E E D I N G S

DR. LIPSETT: Okay. We'd like to get started here. All right. So ordinarily Dr. Alexeeff is the first speaker. He opens these meetings, but I wanted to say a couple of words first. This is not part of the regular agenda.

So as the Panel members know -- Dr. Luderer, I hope you'll indulge me this. Panel members know, except for perhaps Dr. Cranor, who's more recently appointed, Dr. Denton retired at the end of January 2011, and Dr. Alexeeff since then has -- he was initially the Acting Director of OEHHA, and then Governor Brown appointed him as Director of OEHHA, so he could help open and close these meetings and otherwise help facilitate them.

But Gubernatorial appointments in California have a very limited shelf-life. It's one year, unless the legislature adds its imprimatur. And I'm happy to report that, and for those of you who don't know, that the State Senate unanimously confirmed George as Director of OEHHA. I wanted to acknowledge and congratulate him on this.

(Applause.)

DIRECTOR ALEXEEFF: Thank you, Michael.

DR. LIPSETT: And just a couple of other remarks about this. George actually was hired in the Department of Health Services as a staff toxicologist, and this is

before OEHHA, or for that matter, Cal/EPA was even a twinkle in Governor Wilson's eye. So he's been with OEHHA since its inception, and has risen through the ranks. And this is pretty rare among department directors.

So, you know, he's familiar with its entire history. And, again, I just wanted to acknowledge his achievement and congratulate George.

(Applause.)

DIRECTOR ALEXEEFF: Well, I guess I have to thank Michael for hiring me as a staff toxicologist.

(Laughter.)

DIRECTOR ALEXEEFF: All right. Well, I'm George Alexeeff, Director of the Office of Environmental Health Hazard Assessment. And I want to welcome the Panel members and the staff and the public to the meeting of the Scientific Guidance Panel, of the California Environmental Contaminant Biomonitoring Program, which we call Biomonitoring California. And I also want to thank the Panel, the public for taking time out of their schedules to advise us on this program.

Now, we also have another change. Last meeting, I think, or a couple meetings ago, we had announced that Dr. Rupali Das had left for another position. And so I wanted to introduce Dr. Michael DiBartolomeis back there. And Michael is someone who has over 28 years of

professional experience in practicing public health, environmental health protection, and chemical policy development in the public and private sectors. And I guess I can insert here, he also is someone who was hired as a staff toxicologist and worked through the ranks. You know, in the Health Department and OEHHA, Michael and I have worked together on a number of different programs. So it's great to have him here.

(Applause.)

DIRECTOR ALEXEEFF: I'll give you a little bit of his background. Currently, he's Chief of the Exposure Assessment Section in the Environmental Health Investigations Branch of CDPH. And he's the newly appointed lead for Biomonitoring California.

So for the past eight years, he directed the CDPH's Occupational Lead Poisoning Prevention Program. And in 2006, he also created and ran the California Safe Consumer -- Safe Cosmetics Program. Excuse me.

Previously, he'd spent 15 years in OEHHA focusing on pesticide and food toxicology. He earned his doctoral degree in toxicology in 1984 from the University of Wisconsin in Madison, and he's certified by the American Board of Toxicology.

His professional interests include reforming chemical management policy in the United States and

internationally by integrating the principals of environmental justice and precaution into environmental decision making. And I'll have to say this that, you know, we're close to finishing our project called Cal-Enviro-Screen, which is one to address Environmental Justice issues in California. And I remember Michael mentioning this issue Environmental Justice when I didn't even know what it was, and that was years ago.

He also was involved in developing approaches and methods to identify and evaluate safer chemical alternatives and applying prevention and precautionary practices to protect public health and the environment. So I thank Michael for being here.

I also want to introduce another new individual, Dr. Martha Sandy. Where is she?

Oh, way back there.

So Dr. Sandy was recently appointed as Chief of the Reproductive and Cancer Hazard Assessment Section here -- Hazard Assessment Branch in OEHHA. So she's been in State service for 19 years, 15 of them as Chief of the Cancer Toxicology and Epidemiology Section in OEHHA. And before joining OEHHA, she conducted research investigating biochemical and molecular mechanisms of toxicity and carcinogenicity and biochemical and genetic susceptibility factors in Parkinson's Disease. So she has a Ph.D. and

M.P.H. in Environmental Health Sciences with emphasis in toxicology from UC Berkeley. And she's involved in the initial development in implementation of the Biomonitoring California Program, and has served on a number of external scientific advisory committees. So she has taken Lauren Zeise's previous place now that Lauren is Deputy Director for Science at OEHHA.

Also, I want to again acknowledge and thank Dr. Dwight Culver who was a member of this Panel for his service and member -- service to the Scientific Guidance Panel. And Biomonitoring California would like to extend a sincere thank you to Dr. Culver for his service since its inception in 2007 after being appointed by Governor Arnold Schwarzenegger.

And over a period of five years he attended more than 10 meetings and made valuable contributions to development and implementation of the Program. Biomonitoring California has greatly benefited from his unique perspective stemming from his long history of public service.

You know his long career started as a physician in the California State Health Department in 1953, so. And then it continues to this day as Professor Emeritus at the UC Irvine School of Medicine.

And Dr. Culver's extensive medical and public

health knowledge have been of particular value to this program, as we've developed approaches for interacting with study participants. And we wish Dr. Culver the best in his future endeavors.

So logistics. A slight different venue than last time. So restrooms, out the back door, or if you need to the front door, and then to the left and around to the right.

Emergency exits. If there's an emergency need, you'll have to -- there's an emergency exit there, you'll have to exit down the stairwells and then onto the street, and we go directly across -- well, the exits are directly across the hall.

So the meeting is being transcribed. And we regret we're unable to webcast this meeting. There will be a transcript of the meeting posted on the website in about a month after the meeting. Remind people though to speak clearly into the microphones.

So at our last meeting, which was held in Sacramento on November 8th, 2012, the Panel heard Program and laboratory updates and discussed the preliminary Biomonitoring California results from the California Teachers Study and the Maternal and Infant Environmental Exposure Study.

The Panel unanimously voted to recommend adding

p,p’-bisphenols and diglycidyl ethers of p,p’-bisphenols to the list of designated chemicals, and requested the Program bring this group back to the Panel for consideration as potential priority chemicals.

They asked the Program to move forward with a potential -- with a potential designated chemicals document on synthetic musks. And they provided input on the topics for the 2013 Scientific Guidance Panel meetings.

So for a summary of the meeting highlights and the Panel's input to the Program, at the November meeting, please visit the biomonitoring website.

Now, I'd like to turn the meeting over to Dr. Luderer.

CHAIRPERSON LUDERER: Okay. Thank you, Dr. Alexeeff. I'd like to also welcome everyone, the staff of the California Environmental Contaminant Biomonitoring Program, the Scientific Guidance Panel, members of the public, as well as our guest speakers who we're very pleased to have here today.

So the goals for the Panel for the meeting for today are to hear two presentations from two guest speakers, Dr. Linda Birnbaum who's the director of the National Institute of Environmental Health Sciences, and the National Toxicology Program, and Dr. Heather

Stapleton, who's an Associate Professor at Duke University. And we will then discuss implications of their work for the Biomonitoring California Program.

In the afternoon, we'll receive Program and laboratory updates, including some Biomonitoring California results and provide input on that. And we'll also see a demonstration of the new Biomonitoring California website and provide our initial impressions.

Finally, we'll consider three chemical classes that Dr. Alexeeff just mentioned, non-halogenated aromatic phosphates, p,p´-bisphenols and diglycidyl ethers of p,p'-bisphenols as potential priority chemicals and make recommendations. And we'll provide suggestions on possible candidates for future consideration as potential priority chemicals.

So during the time allotted to each presentation, there will be time for Panel questions, time for public comments, as well as Panel discussion and recommendations. I just want to remind everyone how we'll handle the public comments. So if a member of the public would like to make a comment and they're in the room, he or she should fill out a comment card, which can be obtained from the staff table with the handouts at the back of the room, and you can turn your cards into Amy Dunn.

Amy, could you raise your hand. Okay, she's

sitting over there on my right.

And if you're not at the meeting in person, those members of the public have the opportunity to provide comments via email. And those comments will be provided to me, so that I can read them allowed during the appropriate time during the meeting.

So to ensure that the meeting proceeds on schedule, and that all commenters have the opportunity to speak, we'll time the public comments and they will be subject to time limits. So the time allotted will be divided equally among all those individuals who wish to speak.

We also ask that people keep their comments focused on the agenda topics being presented. And then at the end of the day, we'll have an open public comment as the last item of the day, at which time members of the public can address any topic related to Biomonitoring California.

I wanted to remind everyone to speak directly into the microphone and please introduce yourself before speaking. This is for the benefit of our transcriber. And I just wanted to let you know also that the materials for the meeting were provided to the Scientific Guidance Panel members and posted on the Biomonitoring California website. There are a few copies of the handouts and one

sample Scientific Guidance Panel folder for viewing on the staff table in the very back of the room.

And, finally, we'll take two breaks today. One around noon for lunch and another one, a short break, at 2:45.

So now, it's my pleasure to introduce Sara Hoover, the Chief of the Safer Alternatives and Biomonitoring Section of OEHHA, who will introduce our guest speakers for the morning. And after the presentations, there will be time for Panel discussion with the guest speakers and public comment, and then we'll have a brief wrap-up of the morning session before lunch.

Sara.

MS. HOOVER: Thank you, Dr. Luderer. I'll just put this presentation up.

(Thereupon an overhead presentation was presented as follows.)

MS. HOOVER: So, welcome everyone, and thanks for coming.

The first thing I'd like to do to introduce the morning session is to thank Dr. Myrto Petreas. It was Dr. Petreas's idea to link up our SGP meeting with the BFR 2013, the Sixth International Symposium on Flame Retardants, which was held in San Francisco this week. And that's how we're so fortunate to have Dr. Birnbaum and

Dr. Stapleton to speak this morning.

So I'm just going to say some very brief words about what is the theme of this session. So the Panel has encouraged us to try to be out in front looking for emerging chemicals and developing new methods. So the overall theme of this morning's session is to talk about new research that could inform our efforts to select and measure emerging chemicals.

We're going to hear from Dr. Birnbaum about initiatives from NIEHS and from Dr. Stapleton about recent findings on flame retardants.

So I want to more formally introduce them. As Dr. Luderer said, Dr. Birnbaum is director of NIEHS and NTP. And both Linda and Heather have very long bios, and so I'm going to give you some selected highlights of their accomplishments.

As director of NIEHS and NTP Linda oversees a budget $780 million that funds biomedical research to discover how the environment influences human health and disease. The Institute also supports training, education, technology transfer, and community outreach. NIEHS currently funds more than a thousand research grants.

Linda has served as a federal scientist for nearly 33 years. Prior to her appointment as NIEHS and NTP Director in 2009, she spent 19 years at the

Environmental Protection Agency, where she directed the largest division focusing on environmental health research.

She's the author of more than 600 peer-reviewed publications, book chapters, and reports. Her own research focuses on the pharmacokinetic behavior of environmental chemicals, mechanisms of action of toxicants, including endocrine disruption, and linking of real world exposures to health effects.

Linda has received many awards and recognitions. In October 2010, she was elected to the Institute of Medicine of the National Academies, one of the highest honors in the fields of medicine and health. Linda received her M.S. & Ph.D. in microbiology from the University of Illinois at Urbana-Champaign.

And now I'll also introduce Dr. Stapleton. So Dr. Stapleton is an Associate Professor of environmental chemistry in the Nicholas School of the Environment at Duke University. Her current research projects focus on human exposure to flame retardant chemicals, particularly in children, and identification of flame retardant chemicals in consumer products. She is also studying species-specific differences in the metabolism of flame retardant chemicals and effects of halogenated contaminants on thyroid hormone regulation.

In 2008, Heather was award an outstanding new environmental scientist award from NIEHS for her research grant proposal entitled, "Children's Exposure to Brominated Flame Retardants: Effects on Thyroid Hormone Regulation".

In 2012 she received the award for best science paper of 2011 published in the Journal of *Environmental Science and Technology* for her research on the identification of flame retardant chemicals in baby products.

Heather received her Ph.D. in Environmental Chemistry from the University of Maryland at College Park.

So we have obviously two highly distinguished speakers to talk with us this morning. The morning session will start by -- with presentations from our guest speakers and then a Panel discussion with the SGP.

So I'd like to invite Linda up to give her talk.

(Applause.)

(Thereupon an overhead presentation was presented as follows.)

DR. BIRNBAUM: So, first of all, thank you, Sara, and thanks, everyone, for being here. It's really a pleasure. As usual, it's really nice to have a little bit of spring. North Carolina, until I left, we had spring in December.

(Laughter.)

DR. BIRNBAUM: And then it got really cold. And then when I spoke to my husband yesterday, he said it was almost 90 degrees, so I think I go back to summer.

(Laughter.)

DR. BIRNBAUM: So it's really nice for a few days. Anyhow, what I really want to do is very briefly kind of give you an overview of some issues that will be relevant to biomonitoring. Although, I'm not explicitly going to talk about biomonitoring, but talk about some of the strategies that we're using. And a lot of our work now, which is really looking at the issue of what's happening at low levels of exposure, exposures which are relevant to the general population.

And so I'm not sure I really need to remind this group of why environmental health matters, but I think many of you probably saw the recent report that -- reports that came out in Lancet last December, which looked at the global burden of disease, and stressed that at least 13 million deaths could be prevented by improving our environment.

We know that at least 85 out of 102 non-communicable diseases are related to the environment. And I think one point that is important to make is that while so much of the focus on international and health has

focused on infection disease, in fact, the greatest burden of disease is related to chronic non-communicable diseases. And many of these actually have environmental components, and many of them people are just beginning to understand they start early life, and we're not focusing on those issues very often.

So we know that environmental factors at least play a role in at least two-thirds of cancer cases in the United States. And my tag line really is you can't change your genes, but you can change your environment. And I think this is the positive message that we need to get out there.

There's a tremendous amount of work and interest in genomics. That's fine if you're trying to develop approaches to personalized medicine. You're fine maybe if you're wanting to do mechanistic studies. But if you really want to protect the population, we have to understand what things are that are in our environment that we can do something about, and therefore improve the health of everyone.

So I think one point when we talk about exposures is to understand that environmental exposures are very complicated and not the same for everyone. There are thousands of chemicals in our environment. I could quote, you know, the statistics that are often used when we're

talking about TSCA, which we all know is a law that doesn't work. But the point is when it was established, there were at least 60,000 chemicals in commerce. Then we talked about 80,000.

If you go to Europe, which has the REACH Program, which is supposed to ensure that chemicals are tested for safety before you use them, not necessarily only when a problem emerges. But there, they talk about 143,000 chemicals in commerce.

And I would remind you that when we talk about chemicals, we tend to focus on chemicals that are synthetic. But guess what? You know, everything that you eat -- I mean, your food is composed of chemicals. You all take certain kinds of medications, or most people take something, whether it's over-the-counter vitamins or, you know -- or just -- or, you know, some kinds of drugs. These are all chemicals, but somehow we compartmentalize, and we forget that all of these things interact.

And I would remind us that while we tend to focus on one chemical, or occasionally one chemical class at a time, we live in a soup of exposures, and we need to begin to approach and try to understand much better how these things interact.

There's lots of growing evidence now that what you eat has dramatic impacts, not only on how you handle

different chemicals to which you are exposed, but it tremendously alters your micro biocomponents, and your microbiome has a great impact on what happens to not only the foods that you eat, but on the chemicals to which you're exposed.

And I'm sounding like I'm talking all going in one direction from food impacts how you handle chemicals, but it's the other way around also. And there's this interaction, we need to begin to try to approach it and understand that.

So we know exposure also occurs via many different routes, and many different kinds of exposures. I mentioned pathogens here and whether different kinds of microbes are pathogens or not, we need to begin to look at the interactions we have. So, for example, when we understand now that at least four million people die prematurely every year from indoor household smoke. And obviously this is primarily in the developing world where you have indoor cook stoves, which are really anything but stoves, and lack of ventilation, and so on. And about three-quarters of those who die are young children.

But the real reason that a lot of these kids are dying is not only that they're inhaling high levels of particulate matter and NOx and so on, but because exposure to PM and NOx suppresses their ability to respond to a

bacterial or a viral challenge. So therefore, they are more at risk inherently, because of their exposures, which makes them more susceptible.

We also know that exposures differ depending on, you know, on the individual and dose and timing. And I think it's really important for us to stop trying to focus on a certain exposure and thinking that everybody responds the same way, because if you're an infant, if you're in utero, you know, if you're a child, if you're a healthy young adult, if you're an elderly person, your responses may, in fact, be very different, not only because you may be achieving a different does, but because of differential susceptibility.

And there's something else we have to focus on. We often talk about the global burden of disease. But really we should probably be talking about the global burden of disease and dysfunction. I mean, I'm not sure that we call ADHD a disease, but it's certainly alters the ability to function, for example, the way many other people do. Do we call autism a disease? Well, we call it a disorder. Autism Spectrum Disorders, again, because it alters, but it's not a disease.

And so I think we need to be more inclusive in some of the words that we use. But I think that we need to understand that exposures at one point in time may not

be exactly related to the outcomes. That the outcomes may occur days or months or in many cases years or even decades later.

So I've already kind of raised the issue about differential susceptibility, depending upon where you are in your life, but there's a whole new focus that many adult diseases, especially chronic non-communicable diseases, may actually be initiated in utero or in infantile periods.

So why is this?

Well, we know that when an embryo and then a fetus is being formed, you have a time of great plasticity. There's a great amount of change going on. A lot of cell division and differentiation. These are all key opportunities to throw a monkey wrench into the system. And if, in fact, you impact something during development, it is likely to have long-term consequences.

I used to do a lot of work on cleft palate years ago. And, for example, if you expose animals to something that caused a cleft palate, past organogenesis, you didn't get a cleft palate, because the palate was already formed. So that, you know, for example, the heart is beating by six weeks of age actually in a human embryo. So if you're looking at something that's going to affect the structural development of the heart, you know, you really need to

look at something that's happening very early on.

The success of supplementation with folate or folic acid in the food supply, which has really dramatically reduced the levels of neural -- open neural tube defects is because the critical time for the -- when the spinal column and the, for example, close over, the neural tube has to be formed is within the first six to eight weeks. And a lot of women don't even know they're pregnant in that time, so they're not necessarily taking prenatal vitamins and so on. So again, the critical time.

Now, the mechanism for many of these changes we've historically focused, especially on environmental chemicals in looking at mutagens, but we're beginning to understand that you don't have to change the primary sequence of DNA to have long-term effects. You can have epigenetic reprogramming. And epigenetics is -- some people use the analogy that I hate, which is, you know, that the genes, you know, are the gun, and the epigenetics, you know, pull the trigger.

I much prefer -- especially, that's horrible.

(Laughter.)

DR. BIRNBAUM: I know. I much prefer, you know, the hardware/software allusion that, you know, your DNA is the hardware and the epigenetics that's the software that -- in fact, which it is, because that's what tells

what genes are turned on and what genes are turned off. And we know that epigenetics involves not only methylation of DNA -- and I should tell you that in the fertilized egg there is lots of methylation of adenine going on, which we don't really understand, but it's probably real important. It goes away pretty quickly.

And then you have not only the methylation of DNA, which can again be involved, and depending where it occurs, will help turn genes on and off. But then you have methylation and acetylation, and propionylation, and butyrylation and a dimethylation and trimethylation, et cetera, et cetera, et cetera, of specific amino acids in the four histones.

And, in general -- for example, methylation of DNA in general turns of expression of a gene, but methylation of histones, in general, turns on expression of DNA. But it's not that simple. And then you've got all these RNAs running around, the micro RNAs that we used to think about. That was junk. That was pure garbage.

Certainly, when I was, you know, underwent my training, you talked about DNA, RNA, and protein. And RNA there was a messenger RNA, transfer RNA, ribosomal RNA, and all that other stuff in the cell that was junk.

Guess what?

Junk is not conserved evolutionarily.

(Laughter.)

DR. BIRNBAUM: Neither are all those regions of DNA that are not coding for structural genes. We're beginning to understand that they do something. And so these micro-RNAs again are playing a very, very important role in control of gene expression.

So, again, I think I've covered that slide.

So effects can be persistent. And I've said that anything that occurs during development is likely to have long-term consequences. And here I want to talk a little bit about some of the chemicals that are proliferating so rapidly in the environment. Heather will probably use the term of the chemical conveyor belt, where, you know, you have one chemical. You find out it's not, you know, so great, so then you take -- you go to the next chemical, which is kind of -- you know, you put on a little functional group or take off a functional group.

Arlene Blum, who I think you all know, uses the terminology whack-a-mole. You know, you just keep hitting on different things. And it's something we have to begin to address.

As we know, many new chemicals are untested, so BPA I'm -- you know, many of us are concerned about BPA. There's certainly a large body of evidence which is demonstrating not only in the animal studies, but now in

the human epidemiological studies that there are associations with a variety of adverse health outcomes.

So industry is listening. They're concerned. The marketplace speaks. So what are we using? We're using BPS. Guess what? BPS does some of the same things that BPA does, at least in preliminary short-term tests, you know, we don't know.

But there was essentially no testing of it. And I can tell you we're doing a study in our clinical unit, where we've recruited cashiers and we measure their urine levels, because to measure these very rapidly-eliminated compounds, frankly, measuring in blood is not the way you want to go. You can measure what you're looking for in urine. And what we found is we couldn't see any difference in the pre- and post-shift cashiers who are handling thermal paper. Some of thermal paper has BPA. But guess what? Lots of thermal papers now don't have BPA anymore, they have BPS.

We could not see the pre- and post-shift difference with BPA, probably because there's so much BPA all around. But with BPS there was a dramatic increase. So that isn't published yet. We're still -- we're trying to go from I think we have 15 volunteers so far. We want to getup to a few more, but it's kind of interesting.

In addition, we have some chemicals that are very

persistent and can cause long-term environmental health consequences, because you continuously get exposed and the levels build up. But a lot of chemicals, which don't have long half-lives, still can have effects.

And, you know, I've just listed here phthalates, PAHs, flame retardants. You know, what occurs in utero can have very long-term health consequences.

So a lot of our focus really is focusing on what occurs actually within environmentally relevant concentrations. And one of the problems I want to stress here is people talk about low dose. And there's a lot of controversy, apparent controversy in the literature. And part of it is because people don't define what they mean by low dose.

Is it low dose as far as the administered dose? Is it low dose in terms of the body burden, or the internal concentration? Does low dose mean within the internal concentration that you find in the human population?

We've got to encourage people to say what they mean. But we're beginning to understand more and more that endocrine disrupting compounds have many effects. And these occur in region -- I'm going to use low dose much more to mean what we find in the human population, because, you know, these effects occur at very low

concentration.

And what we're finding is that there are lots of animal studies which people used to say were high dose, but they were using the term high and low dose based upon the delivered concentration. And for most mice and rat studies, you've got to use anywhere from a minimum of ten to a hundred-fold higher delivered concentration to get the same internal dose. So you've got to be looking at that. So, again, humans exposed to EDCs and we are seeing some effects.

So the Endocrine Society last year defined endocrine disrupting chemicals as, "any exogenous chemical or mixture that interferes with any aspect of hormone action".

And I think this is important as a overarching definition, because too much of focus on endocrine disruption has focused, first of all, only on estrogens, androgens, and thyroid hormones. And guess what guys, we got lots of other endocrine systems in our body. And remember, our endocrine systems, the role of the endocrine is to main our basic physiology, you know, not only reproduction.

But the other point here is that it's not just binding to the specific receptor. And so much of the focus and even identification of endocrine active or

chemicals has been, you know, is it a ligand for a given receptor or does it block the binding of ligands to a given receptor. And there are lots of other ways that you can perturb hormone signaling that we need to think about.

And a report was just released in less than two months ago, a joint report from UNEP and WHO It was really an update of a WHO report on endocrine disrupting, the State of the Science Report in 2002. So this was an update.

And the bottom line for this report, and I urge you to take a look at it, at least the executive summary, which is fairly short, is that endocrine disruptors are becoming a global threat, and that they need to be addressed.

So it is on -- we actually have it so you can find it on our website, on the NIH website we link to it or you can go to the UNEP or the WHO website and find it.

So some of the research. We're looking at many different endocrine disrupting chemicals across a wide range of exposures and disease endpoints. So I've just listed a couple of my favorites.

So obviously I've already mentioned BPA. Lots of work continues with dioxin, again as a prototypical kind of chemical. I should say that while dioxin exerts essentially all of its effects through the AGE receptor,

the really exciting thing that we're learning here is that the AGE receptor is a key regulatory protein, and development and differentiation can act as a tumor suppressor. So what we're learning from studying the adverse effects of a chemical is actually helping us to understand basic biological processes as well.

Metals. You know, metals don't go away. Exposure continues. Arsenic is an ongoing problem in lots of other parts of the world. I had no idea it was a problem in North Carolina, until one of our grantees at UNC, Rebecca Fry basically they did a survey and it turned out they are lots of people on well systems in North Carolina that have arsenic levels that are more than 10 times the EPA or the WHO limit.

You know, if you go into New England, lots of arsenic in -- about 50 percent of the wells have elevated arsenic. You go to large parts of the southwest, arsenic is a major problem. You don't have to always go to Bangladesh or West Bengal or, you know, Inner Mongolia or parts of Vietnam to find problems with heavy metals. I mean you've got lots in your own state. You've still got chromium problems and, you know, lead, et cetera.

(Laughter.)

DR. BIRNBAUM: So I think another -- we are focusing especially on sensitive windows of exposures. So

we tend to talk about birth cohorts or pregnancy cohorts. Germaine Buck-Louis from the National Institute of Child Health and Development recently published a series of studies called the LIFE studies, where she actually recruited couples post -- pre-conception and followed them. And, you know, dads matter.

(Laughter.)

DR. BIRNBAUM: And when we just focus on pregnancy, we tend to forget about that, and we need to be thinking about that. We're looking at a lot of childhood cohorts and we have recruited some puberty cohorts, which I think are giving us some very interesting data.

I think you all know that puberty, especially in girls, not so much in boys, which is really interesting, has definitely -- you know, definitely the age of puberty has fallen. So that now by the age of eight, almost -- I want to -- I may not have these numbers quite right, but from our Breast Cancer and the Environment Research Program, we now know that the age -- and maybe Nancy can give me the percentages. No.

Okay. So we know that African-American girls are entering puberty sooner than Hispanic girls, sooner than White girls. But even for white girls by the age of eight, about 30 percent -- or 36 percent have actually started into puberty. Age eight. I mean, I've got a

nine-year old granddaughter. She's got little breast buds. And I'm thinking her mind and her body are just completely unsynchronized. I think it's a problem.

Anyhow, we also have a lot of work looking at reproductive health issues, behavioral issues in cancer. And we are very interested in the issue of replacement chemicals, and we really need to move to do better kinds of testing.

So I've talked about hormones a little bit, and I just wanted to give you some examples of what -- how the tiny amounts of hormones -- you know, levels under nanogram per ml have profound effects. If you look at the levels of testosterone in a man, you know, really, you know, 40 picograms per ml have effects. So if you look at the levels of free estradiol in a woman, 50 picograms per ml, you know, actually can have effects.

Well, if we look at levels of some chemicals like PCBs, levels can again be in the -- maybe not 50 picograms, but 600 picograms per ml. Phthalates are in the nanogram per ml levels. And I'm just -- we're actually doing a human pharmacokinetic study in our clinic on BPA. And if you give a dose, which is equal to the RfD, which is based on rat studies and is 50 micrograms per kilogram. If you get that dose to human volunteers, this is the level of free BPA that you get in the blood,

the maximum concentration, very low bioavailability. It's only about -- the ratio between the parent compound and the conjugate, even in the blood, even at the C_{max} is between 1 and 100 to 1 to 1000 to 1.

But the point is human exposures actually in the general population is much lower than this. And yet, we're seeing lots of associations with effects in the population.

So we've also been looking at totalities of the data. And we couldn't really do a formal analysis with some of the work, for example, looking at environmental chemicals in diabetes. I think many of you are aware obesogen hypothesis, which again says that especially exposure to a variety of environmental chemicals may alter your set point and may set you up for obesity. And there's a very high relationship between obesity and Type 2 diabetes.

The point is it's not that you want to give anybody a bye and say oh, you can eat all the fatty food you want, and you don't have to exercise, but are we setting people up to fail, because they are chemically -- the set point is basically chemically reset.

So, for example, some work from Uppsala that we've been involved in has shown a very high correlation between PCBs and abdominal fat and looking at a whole

series of different studies. These are just the forest plots here. And if you look at either for PCBs or especially DDT and its derivatives, what you can see is that in many, many different studies there appears to be, in general, an association.

I should say that the strongest association that we've seen is prenatal exposure to tobacco smoke. Mom is smoking. We know at least to babies that are small for gestational age. We know that there are associated increases in asthma. Well, guess what? Those girls by the age -- they're not girls. Those children by the age of 10 are at increased risk of being obese.

You know, and that -- 22 out of 23 studies. And there's another study that came out recently where it looked from the MoBa study in Norway, where some having managed to start a birth cohort about 10 or 15 -- over 20 years ago, and -- anyway, by the age of 20 in association with the mom's cotinine levels when she was pregnant you see this increase in obesity.

So to talk about flame retardants just very quickly. They have -- PBDEs have a wealth of health effects that have now been documented in humans. And I'd like to point out that every single one of these effects we've also seen in experimental animal studies. So that provides the biological plausibility.

So there are clear evidence of neurodevelopmental effects. Brenda Eskenazi and the CHAMACOS cohort which I think you're probably familiar with. You know from our Children's Environmental Health Center that we co-fund with EPA at Berkeley has shown significant effects on IQ and behavior, as well as there are several other groups have seen these associations.

They're a clear perturbation of thyroid hormone homeostasis. Now what we see in the humans is not clear. Animal studies we almost always see a decrease in circulating T4. In humans, sometimes we see -- most of the times we see an increase. A couple times we see a decrease. We don't really understand it, but it's clear that the thyroid system is being targeted, and it is being altered.

And then there's growing evidence for reproductive developmental effects, so undescended testicles in baby boys, early menarche in girls, effects on circulating levels of a number of different hormones, even associations with decreased sperm count and testis size, for example, in boys. BDE is the abbreviation for specific brominated diphenyl either congener.

So I mentioned BPA. And I think there's a lot of the studies that have looked cross-sectionally now at BPA and shown associations with, for example, decreased sexual

function in males, decreased sperm count in males -- these are some occupational studies -- evidence looking at the NHANES database cross-sectionally effects, for example, on cardiovascular disease and obesity. There are a couple studies. One study has actually come out of New York City showing an association with obese and overweight with mom's BPA levels during pregnancy.

Russ Hauser from Harvard has done a series of studies that have -- looking cross -- looking longitudinally at this cohort. It was in women who were trying to become pregnant, and needed Assistive Reproductive Technologies. And they measured their BPA levels, and they continued to follow them, and there was clear association with reduced ovarian response in the women with higher BPA levels. And they had lower peak serum estrogen levels. And they also had an increased odds of implantation failure. That's just kind of concerning.

This is just some of the data from another paper from Russ. And he did this in conjunction, for example -- CDC, by the way, does all the biomonitoring data for many of our children centers. I should mention that, and a lot of the work there.

But this is some data actually that Jodi Flaws who's an expert in ovarian development and function

actually did this part of this. She's at the University of Illinois. And what you can see here, the average BPA levels are just under two and this is urinary levels. So what you're really looking at is the conjugate, which is eliminated in the urine.

So, let's see, on your left, the second bar basically covers the average range. And there's really no change between, you know, the first and the second quartile. But as you start increasing the BPA levels, you can see that not only the number of mature oocytes, but the numbers of fertilized eggs are decreasing in association with BPA.

So how do we look at all this data?

OHAT, is our Office of Hazard and Translation. It's part of the National Toxicology Program. And we're trying to develop systematic review approaches for use in public health -- public health evaluations. And I think this has grown out of the evidence-based kinds of systematic reviews that are used in clinical studies.

And we're really asking the question, how do we take clinical studies, plus epidemiology studies, plus animal studies, plus mechanistic studies, and how do we lay them all out there so everybody can see what we looked at? What are the criteria we're going to use? And then how are we going to evaluate them and rate all these

different studies?

In no way does this approach eliminate scientific judgment, but it makes anyone see what was the basis for the judgment that you used. And if any of you are interested in this, we're having a webinar on April 23rd. You can find it on the NTP website or the NIEHS website. And it will be an opportunity to look at -- you know, you can set up this whole system. You can say how it's going to work. You've got to try it.

So we've developed a couple of prototypes, you know, to see how it works. And the one that's going to be on the webinar is going to be about BPA and diabetes and obesity. So April 23rd if you're interested. But we're hoping here to really be able to better characterize the dose response for each health outcome, and again combine all the inputs.

So some of the new research and new programs at NIEHS. Again, I'm going to give you another example of BPA, because this is an example of what we're trying to do. We're trying to bring together different parts of the Institute for kind of my vision of one NIEHS. So we have this very large project, which has taken NTP, our extramural grantees, our intramural scientists, and FDA -- and FDA is part of the National Toxicology Program as well. And we're trying to look at linking some of the

mechanistic kinds of -- more academic studies with the regulatory kinds of studies.

And we're actually doing a GLP-compliant study of BPA toxicity in rats starting on gestation day 6 up until two years of age. These studies started last fall. They're well in progress. We have a very broad range of doses, much more than kind of the standard NTP, which is like, you know, control plus three doses. We've got, I think here, control plus six doses. We're using estrogen as a positive control.

Although, as I keep reminding people, BPA is not just an environmental estrogen. It does lots of other things, and it affects lots of other signaling systems than just the estrogen system.

But we've got at least 12 different grantees. We just had another one join. They were intimately involved with FDA, with NTP in the planning and the conduct of these studies. And from the pre-chronic studies, which were completed last summer, we are, I will tell you, beginning to see some results, some effects, which would not be seen in a standard guideline kind of study. You know, it's like if -- when you look, you find.

Another thing that we're really focusing on is the issue of -- I talked about exposure before. We co-funded, along with EPA, a NAS Committee to look at

exposure science in the 21st century. This was really a follow-on in some ways to the toxicity testing in the 21st century, the NAS report, which has had a huge impact that was released in 2007.

We are very interested in the exposome, which, you know, has been defined as the totality of human exposure. I really think we have to begin to define it in a way that we can use it. You know, if you think, you know, doing deep sequencing of a genome is difficult, welcome to the exposome. I mean it's orders of magnitude more complicated, and it's much more than just biomonitoring.

So, again, we have to focus on what is doable today, and we need to look at the individual susceptibility issues. We're looking at chemical mixtures. I mentioned the point that we live in soup. So one of our approaches right now is we're beginning to focus on how do we look at the totality of PAHs, not just the 11 or 12 that people have some information on, because there are many, many, many, more PAHs, and different sources lead to different kinds of PAHs.

We in part got into this because of the Deep Water Horizon explosion, almost exactly three years ago, where there was a great deal of concern about seafood, and the contamination of seafood with PAHs. And, of course,

FDA has said, oh, everything is below the level of concern, but nobody is looking at the fact that you've got 50 or 60 different PAHs that are all in the food and how do you begin to total them up?

So we're developing an approach to begin to look at the totalities of exposure and looking at many different effects.

This is just some -- I think some very exciting work coming out of Shuk-mei Ho from Cincinnati, where she can actually look for biomarkers of PAH, which she sees by looking at epigenetic methylation changes in blood cells of firefighters. And what you can see here is a clear dose-related change in the levels of this biomarker in white blood cells with the years of firefighting service, and it clearly again is related to years of service, not the age.

We have this whole new approach for tox testing the 21st century, we call it Tox21. This is a joint program with NCATS, which is another center with NIH, and EPA and FDA, which is involving high-throughput screening. We have already screened well over 10,000 substances, 15 point concentration response curves, repeat each one done three times. We have looked -- and this has focused so far on nuclear receptor binding and measures of oxidative stress.

And I can tell you that we're beginning to see patterns of effects emerge. Clearly, these approaches are going to be robust for prioritization and screening. Our hope is eventually as we gather enough data, we may be able to use them actually as replacements. We're also using the robotic approach to look at differential susceptibility.

You know, everybody is not the same and so we've actually taken over a thousand different cell lines represent from nine racially distinct ethnic populations. And we screened these looking just at viability. And again, you can see differential responses related to different genetics in these populations.

And we -- because we have to begin to look at the variability in the population that exists. And that's one of the problems -- a tremendous problem that we have with our rodent studies. We tend to use inbred strains of mice or rats, or we use an outbred strain. But let me tell you the outbred strains are not really so outbred. They're actually fairly inbred.

And so there's this whole new approach to develop the collaborative cross, where there are now up to 250 different strains, and they range across mousedom.

(Laughter.)

DR. BIRNBAUM: Okay. So you've got -- you know,

and then, in fact, what -- you can kind of lay these out and you can look at something -- and this was done beautifully at UNC, where they actually looked at acetaminophen response in people. And you could lay 60 of these mouse strains right along with all the people that they had, right, from people who are very poor metabolizers to people who were very, very rapid metabolizers.

So that by using this new approach -- and the diversity outbred is where you basically combine some of these strains to give you again a way to deal with the variability in the population, I think eventually this is going to be a much more powerful way than using a single inbred strain of animals. And again, every time I hear someone say, "oh, okay, you know, I want to do some breast cancer work". And I say, "Well, do you want a strain that will never get breast cancer?"

(Laughter.)

DR. BIRNBAUM: "Do you want a strain that will always get breast cancer?"

(Laughter.)

DR. BIRNBAUM: And then they look and say, "Well, which one is representative of the human population?" And I say, "Both", you know, because, in fact, we have that variability in the population, and we need to understand

it.

So there's a new vision and mission for NIEHS that will provide global leadership for innovative research that improves public health by preventing disease and disability. And our mission is to discover how the environment affects people in order to promote healthier lives.

Our strategic plan went on-line. We completed it after a very inclusive stakeholder-driven process. It went on-line last August 1st. It is really -- we see it as a blueprint for the entire environmental health science community. We can't do it alone.

There are the themes that have a broad scientific context and the 11 specific goals. Many of our themes are studying basic mechanisms and windows to susceptibility. We're linking individual and population exposure to risk. We think it's key to create better predictive models and 21st century tools. We're thinking -- we can't do any of this unless we can communicate what we're finding, and include diversity in all aspects of our research.

I should say one of our themes is health disparities and global environmental health. We've got to train a multi-disciplinary group of scientists. You cannot do science in the 21st century, certainly environmental health, human science, unless you have

transdisciplinary, multiple disciplinary teams. And we need to improve coordination between government agencies, as well as other stakeholder groups.

So thank you all for your attention.

(Applause.)

CHAIRPERSON LUDERER: Thank you, Dr. Birnbaum for that very inspiring talk. We actually have a maybe a couple minutes here for some questions from the Panel and then we'll have more time for more questions and discussion after Dr. Stapleton's talk. So, Panel members, any kind of clarifying questions.

Dr. Quint.

PANEL MEMBER QUINT: Hi. Julia Quint. Thank you for a wonderful presentation. Very inspiring. And I'm just wondering how -- if there has been any conversation with NIOSH. I work in occupational health. And your talk just really emphasizes how far behind occupational health, as a discipline is, in terms of managing chemicals, identifying hazardous chemicals. And this probably will change even more with the new hazard communication regulation.

So, you know, we haven't dealt well with high doses. We still aren't recognizing that TCE causes cancer in terms of regulating it. So what is NIOSH's role in this, or is there a role?

DR. BIRNBAUM: Yeah, so NIOSH -- CDC as a whole is part of the National Toxicology Program, and specifically NIOSH. So through NTP, we partner with them extensively. We have also been involved in training some of the Environmental Research Centers. Most of them have been closed because NIOSH basically had that removed from their budget year or two ago.

But we have some very close collaborations with them. In addition, for example, in the area of nanosafety. You know, we're all busy putting nanomaterials on our bodies all the time, and we may be taking them in our food and everything else. And we know relatively little about the potential safety. So we're partnering with them very intensely in that area, but a number of other areas. And we do -- they do sit on the Executive Committee of NTP as well.

PANEL MEMBER QUINT: Good.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: Mike Wilson from UC Berkeley. And I just want to second my appreciation for your talk. And I want to -- I just have two questions.

One is a follow up to Dr. Quint's question, and that is, first, if NIOSH has entered in at all into the arena of low-dose effects? And, you know, recognizing that, you know, we're so, so far behind in terms of the

occupational exposure levels in the U.S. But is there any interest or involvement by NIOSH, you know, to begin, you know, just changing the nature of that discussion? That's my first question and then I have a second one for you.

DR. BIRNBAUM: Okay. So the answer is, is they are aware of what we're doing. They actually also sit as ex-officio members of our National Advisory Council. So they participate in that. They are also obviously members of the -- not only the NTP Executive Committee, but they sit as ex-officio members of the Board of Scientific Counselors of NTP as well.

But I think that they are so overwhelmed by what they're supposed -- what their challenges are, and they've had such severe budget cuts, I mean, our budget unfortunately now as of March 1st is not 760 million or -- it's down about 45 million because of sequestration.

But, you know, they were hit very badly in FY 11 and FY 12, so -- but we do try to -- I meet with John Howard a couple times a year, just one on one, to talk about new issues.

PANEL MEMBER WILSON: If I could follow that up just quickly.

CHAIRPERSON LUDERER: We're going to try to hold questions till after Dr. Stapleton's talk, and then we'll have more time for discussion, since we're a little bit

behind here.

PANEL MEMBER WILSON: Great. Okay. Thanks.

DR. BIRNBAUM: Thank you.

(Applause.)

MS. HOOVER: Yeah. We'll have more time for a full Panel discussion and interaction with both speakers.

(Thereupon an overhead presentation was presented as follows.)

DR. STAPLETON: Well, good morning, everyone, and thank you for this nice invitation to come here and speak today on the little bit of the research that we've been doing in my lab, and then provide a little bit of a summary of some other research that's going on related to flame retardants. And I'm sure everyone here is very familiar with the issue of flame retardants, as it has hit home specifically to a lot of issues here in California.

So I'm sure many of you are very familiar with California's Technical Bulletin 117. You've probably seen that label quite often, maybe even on your own furniture, but to give you an introduction to this topic and some of the research we've been doing in my lab recently.

Obviously, pentaBDE was a popular commercial mixture used to meet TB 117 that affects residential furniture use, primarily in California, but recently affects furniture sold throughout the country. And

because of its properties related to persistence, bioaccumulation, and toxicity, it was phased out. However, there's very limited data available on potential replacement chemicals for this.

And I have this table up here, and I know there's a lot of information, and it's very small. And it's not to have everyone scrutinize all these different parameters, but this is just an example of a table that's been provided by a program at the EPA called the Design for the Environment, which has a role to provide information on health effects, persistence, toxicity for alternative flame retardants.

And this is one of the first assessments they conducted for -- was for pentaBDE, where basically they're looking for all viable chemicals on the market that could be use as replacements, and then they evaluate them typically through QSAR models for potential toxicity.

There's just two points I wanted to make is that really a lot of the data on here is all from models, because there are no data available on the research -- the published peer-reviewed literature. Most of them are all additive, similar to the penta mixture, meaning they're not chemically bound to materials, more likely to leach out.

And lastly that a lot of these were proprietary.

If you look on the left column, these are examples of the different commercial mixtures on the market that can be used in furniture to meet TB 117. And you can see they say proprietary. Proprietary, proprietary, proprietary.

So under TSCA, all these chemicals can be proprietary, and their chemicals structures or identity can remain confidential. So from my perspective, this raises a lot of questions. If we phased out the pentaBDEs, TB 117 is still in place, what's going to be the dominant chemicals on the market to meet this? What are we going to know -- what information do we have on the potential fate of these new flame retardants? Should there be concerns about potential exposure and health effects?

So this led to some studies in my laboratory where, because this information is proprietary, there is no way to access this information. We ended up spending a lot of time and resources to actually screen consumer products to get a better understanding of what chemicals are being used to meet California's TB 117. And we've done this for two different projects, both of which are now peer-reviewed and published.

The first one was on baby products. Many infant products meet TB 117. And then secondly just a few months ago, we published a paper on the use of chemicals in

residential furniture, and in this case primarily couches.

So I want to go over some of the information we learned from these two studies. The first was a study screening baby products. We looked at 101 different baby products. And these were typically products in use. And we had volunteers that would actually go to these products and take out a little piece of foam from the interior of the product, and wrap it up foil. And Arlene Blum's group from here in California helped us with the collection of those samples. So some were from California. Some were from other states in the United States.

And they were sent to my lab blind, and we analyzed them using a lot of analytical techniques. So examples of products we tested are things like car seats, nursing pillows, some strollers, sleep positioners, the mats that you put on changing tables, portable cribs. A lot of these materials have foam and are considered juvenile furniture and have that TB 117 label on them.

So after our testing, we found that 80 percent of them did contain a flame retardant. And the most common flame retardants that we identified was a chemical that I'll use the acronym, TDCPP, or chlorinated tris, a new mixture on the market, which is considered proprietary, and until we found out what was in it, called Firemaster 550, and another mixture called V6, which I'll talk about

in a little bit.

We did find pentaBDE in five samples, but those were all samples that were purchased prior to 2005 and the phaseout. And we were able to use some of our more advanced analytical skills to identify two new chlorinated organophosphate mixtures that had not previously been identified and are proprietary as well.

And I wanted to raise the point that, to my knowledge, there are really no risk assessments conducted on these types of products. They are certainly conducted for furniture, couches. When you have these chemicals in there, what's the potential for exposure. But an infant sleeping on a sleep positioner with a flame retardant spends a lot of time in very close contact to the surface of that material, and they can migrate out. And for some of these flame retardants, it is proposed that off-gassing is the major route by which they escape from these materials.

And so an infant that's sleeping there in very close contact to the surface will receive a higher dose of exposure than someone just 10 away after you get dilution in the general room area. So, from my perspective, that's an important concern.

And I am happy -- I was happy to hear that some of the products have recently been exempted from TB 117,

and hear more maybe proposed recently as well.

I know a lot of people are not chemists, but I wanted to put out some of the structures that we identified. And throughout the talk I have several where they are identified in red coloring. And the ones that are in red coloring are chemicals that, to my knowledge, I do not believe are on the biomonitoring list. So I wanted to highlight those.

So most people might be familiar with all these chlorinated tris compounds, which are the three chemicals on the left TCEP, TCPP, and TDCPP. TDCPP, the one on the bottom left, was just recently added to Prop 65. V6 is the one in the upper right corner that is now on your list, I noticed. It is being used. We found that in a lot of nursing pillows actually.

The concern with V6 is that it has TCEP as an impurity. And I'll come back to that. But some of the mixtures on the market do have that as an impurity.

And then there's a very similarly structured compound, we call it unknown OPFR. It's very similar to V6. It just has slightly -- or longer alkyl changes. And we've not yet found a manufacturer that's admitting to using this, but we have very good data supporting it's out there, and we have found patents for it. So we do believe that it is being manufactured and used, and we know

nothing about this chemical as well.

And then triphenyl phosphate is found in almost all flame retardants, and it's also used as a plasticizer. So we pick it up quite frequently in a lot of the flame retardant mixtures. It was actually used at the same time. It was actually used with pentaBDE to meet TB 117, but it's in a lot of the new mixtures as well. It's quite frequently used.

And just further on V6 specifically, we actually just published this paper last week, where we followed up on a V6, because there are no measurements on V6, to my knowledge. And we don't have standards for it. And so what -- I was fortunate enough to have a new Ph.D. student from China who actually called up some Chinese flame retardant manufacturers, asked them if they'd be willing to sell us some of their V6 and they said sure.

(Laughter.)

DR. STAPLETON: So they shopped us over a whole kilogram of it.

(Laughter.)

DR. STAPLETON: And we were able to actually purify it to use it as an analytical standard. And it actually gave us the opportunity to see what the impurity levels were in this mixture. And we actually found out that TCEP, which is a carcinogen, was 14 percent by weight

in this impurity from the mixture from China.

So we've done some work now looking at both V6 and TCEP and dust samples and in the baby products. So the same baby products we had screened before and identified in V6, we went back and measured them. And they're about five percent by weight as V6. And then we see the TCEP in there about 10 percent of the V6 levels.

The levels of V6 in dust are lower than they are for TCEP, but which is likely related to their physical chemical properties, because it has a lower vapor pressure than TCEP. But what was interesting is that levels of TCEP and V6 were significantly correlated in the dust samples.

So if you had higher V6, you had higher TCEP, which to me suggests they have a similar source, which is like the V6. So I do think the presence of TCEP in house dust and dust in other micro environments is attributed to V6, not all of it necessarily, but at least some of it.

So we also followed this up with another screening study looking at residential furniture, and in this case focusing specifically on couches, just to make it more specific. And again, we had about 100 samples that we screened, again, working with Arlene Blum's group at the Green Science Policy Institute.

But this time, we used more -- a specific study

design to get more information and exactly when the product was purchased, what State it was purchased in, did it have the California TB 117 label on it or not primarily to ascertain whether that label is a good screen for the presence of flame retardants.

And what we found -- in most of these products that we examined in our study were purchased between the years of 1985 and 2010. So we had a good amount of data before and after the phase out of the pentaBDE, which was really nice. So, in this case, about 87 percent did contain flame retardants.

The three most common flame retardants we detected in this case were TDCPP again, pentaBDE -- although, as you'll see in a minute, most of that was prior to 2005 again, and then Firemaster 550. But in this case, we also again identified two new organophosphate flame retardant mixtures that are likely proprietary, so we could determine what their structures are. But again, we don't have -- we have very little data on them. And they were different than the ones we detected in the baby products study, so I'll point that out.

This is actually a table that is in the paper. And I will say that paper -- it's published in ES&T, but it's open access, so it's available to anyone from the public. You don't have to be a member to get that paper.

If anyone wants to go on-line, they can access it themselves.

And this is just one of the tables in there, and it provides a lot of information. And there's just a few things that I wanted to point out.

Basically, and just like the baby product study, we found that about five percent by weight of the foam was the flame retardant material. It was very similar to the baby products study. Although, you get a range. Some are closer to 10 percent, some are one percent, but on average they're five percent.

And we measured the concentration for some of these chemicals in the products, but you'll notice that the range -- the values will range quite a bit. And that's because a lot of these are mixtures. And we only have chemical standards for some of the components, not all of them. So for some of these it might say it looks like it's only two percent or less than one percent, but that's because maybe we can only measure one of those components, because there's no standards available by -- for the one -- for the flame retardants where we do have a standard for either every flame retardant in that product, it's about five percent by weight.

We did look at trend pre and post the penta phaseout. And we found that prior to 2005, there was

higher use of flame retardants in California. There was significant use of the penta, but there was also significant use of the TDCPP. And I think most people previously believed that it was primarily penta or PBDEs being used to meet TB 117, but our data demonstrates that TDCPP has been used for quite a long time.

And then after 2005, we found this growing number of flame retardants on the market, because primarily it was only the two before 2005, and now we're finding at least six or seven used in furniture after 2005. And basically it's being used everywhere. We don't see a difference between California and the other states. So, in fact, TB 117 does seem to be a de facto standard for the whole country.

And when we tried to use or look at the information on TB 117 label, we found that the presence of a label certainly indicated that flame retardants were there, but a lack of a label did not indicate the absence of a flame retardant. So if it doesn't have a label on it, that doesn't mean it doesn't have a flame retardant on it is basically the message.

So I just wanted to briefly talk about the two mixtures we identified in the study. And so some of these are on the biomonitoring list and some are not. And it might be hard to see the red numbers on here.

Numbers one and two are on your list, but numbers three and four are not. And so this is one of the new mixtures. I call it TBPP. It is a mixture. And they're all non-halogenated aromatic phosphates. Four is tris(4-tert-butyl) phenyl phosphate. And basically the numbers two and three are just isomers of that mixture.

We found this in only eight samples, but I will say we've actually been working with furniture manufacturers in North Carolina and elsewhere when they wanted to move away from TDCPP, because of Prop 65. So they sent us samples to screen to make sure their foam suppliers had really stopped using it, which actually was nice, because it gave me an opportunity to see what they were all switching to.

(Laughter.)

DR. STAPLETON: And a lot of them had moved to this. So it was either Firemaster 550 or this mixture, which is why I do think this one might become more important in the future, if TB 1 stays around or if we still continue to use flame retardants in foam, because there are more people moving to this mixture.

And, to my knowledge, we don't know very much about some of these mixtures at all, or some of these congeners.

The other mixture we identified -- and this was

only in two samples, and I've seen a little bit use of this mixture in other items, not as much as the previous mixture. But this mixture has again triphenyl phosphate, which is often in these products.

And then this has methyl phenyl diphenyl phosphate or bis(methyl phenyl) diphenyl phosphate. And I don't think these are on the list. Although, I'd have to go back and check again. But what's concerning to me is that these are a very similar structure to tricresyl phosphate.

And now I had a standard for tricresyl phosphate and these did not mach that standard. So this tells me -- or tricresyl phosphate has the methyl group in the ortho position, so I think this is likely in the meta or the para position, but again we don't have standards to confirm this. We can only tell what it's structure looks like. We can't tell the exact position of some of the substituting groups.

So this one might grow in use in the future. We don't know, and we're hoping we can keep an eye on some of the -- do some more of these types of studies to better understand where the market is moving and what flame retardants are more commonly used.

And this also provides us an opportunity to start looking for them in house dust samples, which is a primary

route of exposure to the human population. And I'll talk a little bit about that.

Before I do, I wanted to mention a few other studies in the use of flame retardants in consumer products that I've seen. HBCD, a brominated flame retardant, which is on the list and is fairly persistent and there are concerns about effects on thyroid hormone regulation.

It is also used in textile applications. And there was a paper that came out of Japan where they looked at HBCD in curtains. And they did find it in curtains. They also found one with decaBDE in there as well at about two to four percent by weight. And this is something to my knowledge people haven't looked at a lot.

We do know it's used in insulation, but there also are textile applications, and this could be a source of exposure in the home. And secondly there was a paper on the presence of the deca in TVs. And this is, you know, a fairly well standard -- or common knowledge now.

Basically 10 to 15 percent by weight of the casings on TVs are often decaBDE. And now, hopefully that market will be changing as the phaseout of deca hopefully goes through later this year, but most of the replacements, at least that we've seen in our lab, are decabromodiphenyl ethane, which is basically the same

chemical. You just change the ether linkage to an ethane group. So there are concerns about similar persistence and effects on the environment.

So these are two other brominated flame retardants that are also on the market right now, which I do not believe are on the list. One is basically a triazine-like compound. It's been detected in some studies conducted over in China, used in polypropylene, polyethylene, polystyrene. Based on the structure, it's likely to be also persistent.

And OBIND, is basically a brominated indane, on the right has also recently been detected in bird eggs and some other areas in China. And actually at the meeting this week, I saw more studies focusing on this brominated indane, and they have found it in house dust as well. And that's primarily used in electronic products. But we might expect to see more of that occurring in the future as well.

So I know everyone is familiar here with the fact that, you know, risk is a function of both exposure and effects. And I put this up here to kind of make a point that while we're lacking a lot of toxicity data or health studies for some of these flame retardants, but right now it might be easier to characterize exposure to some of these compounds. And so my interest has been trying to

focus on the flame retardants where we know exposure is great, that you're receiving higher levels of exposure in indoor environments particularly. And maybe that's a way to help prioritize where our research efforts should go.

So I just wanted to focus a bit on measurements of some of these flame retardants in indoor dust. And this is good timing, because right here in California, there was study just published just a few months ago looking at some of these flame retardants, both historically the PBDEs and some of these new flame retardants in dust, collected in 2011 in this case reported on by Robin Dodson from the Silent Spring Institute.

And the point I want to make here is that most of these are detected quite frequently. This column it says percent detect. It's almost a hundred percent for all of them, meaning it's a very ubiquitous compound in a lot of dust samples. It was small number of samples, 16, but I can tell you the data coming out of my lab from samples in North Carolina finds almost exactly the same thing. We see very similar levels, very similar detection limits.

So there's a range in values and these are log normally distributed, meaning that some homes have very high levels, some people have very low levels, and likely due to different sources, but it's impossible to say,

because you can't identify what the source is in the home.

So when we're kind of characterizing risk, we have to remember that there is this part of the population, even though we're only five percent, five percent of the population is a lot of number of individuals that are receiving very high exposure, and again, not to one chemical at a time, but mixtures of these chemicals.

Some of them are going up. Some of them are going down. Some of them are fairly stable. But these new mixtures, there's a -- I'm pointing out here, TCEP, TCPP, and TDCPP are these organophosphates called the chlorinated trises. TPP is in a lot of flame retardants. It's also in Firemaster 550 with TBB and TBPH. And these are detected quite frequently and they're reaching levels closed to PBDEs, not quite there yet.

But we also know that there are other sources of some of these components outside of Firemaster 550, so that complicates the issue a little bit.

So I want to talk a little bit about known health effects for TDCPP and Firemaster 550 for just a moment. I'm sure a lot of people in California are quite familiar TDCPP. And I know Arlene Blum's group and Bruce Ames did some work back on this in the 70s suggesting it was a mutagen and it was phased out from use in children's

pajamas.

But then low and behold our data says it's been use in furniture for, you know, at least several decades, and that's why levels are -- in indoor dust are likely very high. The NTP has conducted a study on TDCPP and found increased incidence of tumors. It is considered a probable human carcinogen. And there has been some work looking at exposure levels by the Consumer Products Safety Commission.

They have this report that came out in 2006, but again it's all on modeled data, but they do have an exposure level that's where they considered to be at increased risk for cancer, based on that report. But again, it's based on a furniture item in a room with children, and they're not considering exposure from all these baby products, which I think could be much higher. So that's important to state.

My group has been working with some pharmacologists at Duke that have done a lot of work on organophosphate pesticides. And using in vitro models or cell cultures, some of our data did suggest that TDCPP may be a neurotoxicant, and had somewhat similar properties as chlorpyrifos, which is a little bit concerning.

And we've also recently found that TDCPP is being used as -- to meet a separate flammability standard called

CPAI-84, which is a voluntary fabric flammability standard. And now we don't have this published, and I'm not sure if we'll get the opportunity to do it, but we have found it in tents. It's used in camping equipment tents, but we've also found in children's tents and tunnels, which will probably be a little bit concerning. I've actually spoken to the CPSC about this, and I'm hoping that's being phased out now.

In terms of tracking exposure, it's important to have a biomarker, and this is something we've worked on in our lab, by first looking into literature and then trying to characterize the metabolism and half-life in the body.

Now, TDCPP as an organophosphate is fairly rapidly metabolized, but we have developed a method to monitor this metabolite in urine, and we've been doing this now with several collaborators. And I'm happy to say our two first papers on this were just published very recently. The first was in a cohort of men -- I think actually Linda was referring to this, is with Russ Hauser's group -- of 45 men in a fertility study where we looked at repeated measures of these metabolites in urine, so you get an understanding of how a one-time urine measurement might replicate average exposure over time.

And then also looking at exposure in office co-works -- office co-workers -- and this was actually

piggybacking on a PBDE study -- but to give us a better understanding of whether levels in dust might be associated with your urinary levels of this metabolite.

So this is some of the data again that was just published. We have very high detection frequencies of these metabolites. They're log normally distributed, like what you see for parent compounds and the indoor dust. Geometric mean values are 135 and 408 picograms per ml.

But what was really nice in this study, primarily from the study published by Meeker et al. is that if interclass correlation coefficients were fairly high, meaning that if you have a one-time urine sample, it should be fairly representative of what the average exposure is. Because what his group did is take repeated urine samples from these men over time, some within a period of two weeks, some within a period of three months. And I know it looks like there's a bunch of scatter in that graph, but if you calculate the correlation coefficients they're up 0.62, which, to my knowledge, is actually much higher than for organophosphate pesticides. And just something I was hoping I was going to talk to Asa about a little bit later. He knows more about this than me.

But it does suggest that a one-time urine sample might be very helpful in determining chronic average

exposure in the home, so that was very encouraging.

I also wanted to talk about Firemaster 550 as this is still being used. It's the second most common flame retardant we've picked up both in the baby products and residential furniture. It was proprietary until my colleague actually got a sample of it from Chemtura, and sent it over to me and we figured out what was in it.

And there are basically four ingredients, two of which are these aromatic organophosphates, the other two which brominated. There's been a lot of focus on the brominated ones. And I know there's often concerns about the halogenated chemicals. And EPA actually issued a consent order for more testing, which I thought was the whole mixture, until I realized about six months ago that that actually was just on the two brominated components and not the full mixture.

And I knew they had found something when Chemtura was doing -- was conducting these additional testing on it, but nobody knew what it was. So I actually teamed up with a colleague of mine from NC State, who is a reproductive toxicologist. And we conducted our own experiment on Firemaster 550, which I'll talk about in just a minute, which I think is somewhat enlightening.

But before I do, I also wanted to make out the -- mention the point that the ITPs, Structure A in that

diagram, they are actually a mixture of these isopropylated triaryl phosphates. But my colleague, Dave Volz, actually just conducted a study with these compounds in fish which can sometimes be used as a model for humans. But he found that there were some dioxin-like toxicity associated with exposure to ITPs.

Now, it certainly requires a bit of follow-up research. We don't know if there's impurities driving this or not, but it was fairly potent in fish, as an agonizing AHR, which is known to be associated with dioxin toxicity. So that's something we also want to follow up on.

Now, again, my lab is very interested in the metabolism, so we're trying to understand the half-life in body, and whether or not we can develop biomarkers for the parents for the metabolites. I had a Ph.D. student conduct some testing on these components in Firemaster 550 to examine metabolism using both rat tissues and human tissues. And what we found -- and here we focused on the brominated components because we have standards for those. We don't have standards for the ITPs.

We found that TBB was fairly rapidly metabolized to a brominated benzoic acid, whereas the phthalate was not very well metabolized, which is no big surprise to me, being it's a very large molecule. And I will mention that

this TBPH compound is basically the brominated analog of DEHP, which is a phthalate there's a lot of concerns about.

So really all they did is put bromine atoms on DHP and it's used as a flame retardant, both in Firemaster 550 and both in a mixture called DP-45, which is used in electrical applications.

So it does seem like that it would be more stable in the body if it does bioaccumulate. Although, I'm not sure how much would bioaccumulate given its very large size.

But as I said, we worked with Heather Patisaul at NC State to conduct a small study on -- five minutes. Okay -- in vivo exposure study. And so what we did is we exposed pregnant rats to Firemaster 550 from gestational day 6 to postnatal day 21, and looked at a few effects in the parent -- the pregnant dams, but then also followed the pups up through seven months of age.

And as I said, EPA asked the manufacturer to do more testing on Firemaster 550, but they tested at very high doses is one point. And again, it was only the brominated compounds. But they can -- they found all these effects at low doses. But because those effects did not increase with dose, they said that was spurious and unrelated to treatment. So they had a number of

significant effects at the lowest dose they measured relative to control, but because they didn't increase with dose, spurious unrelated treatment. We're going to call the no observable adverse effect level 50 mg per kg.

Now, our highest dose we tested was only 3 mg per kg, so an order of magnitude lower than that. I want to point that out. It was very limited, because there was only three rats per treatment. It was really what we could afford to do at the time.

And we followed these rats up to seven months of age. Just a little bit of data on this. This is now published. Looking in the liver tissues first, we looked at the parent brominated compounds and their potential metabolites. And the phthalate did accumulate in the liver of these rats in a dose-dependent manner. And that was higher than the TBB compound. But we found that there were higher concentrations of the TBB metabolite in the liver than there were the parent compound, again matching what we saw in vitro, that this one is rapidly metabolized, the other one is not. So it was interesting.

We found effects on thyroid hormone levels in the pregnant rats. So with increasing dose, there were increasing concentrations of thyroxine, which is a thyroid hormone in the blood. It was statistically significant, but not for the other thyroid hormone T-3, but again that

was a very small sample size.

But what was most interesting to us, which we never expected to find was obesity in the pups. So these are the pups and their body weight over the seven months period, both in males and females. And it's probably hard to see with the different doses.

They were actually statistically heavier -- or the pups were heavier at postnatal day 10, but then that difference between the controls and the exposed increased over time, such that by seven months of age, the males were 32 percent heavier than controls, and the females were 23 percent heavier than controls.

So there's overweight and then there's obese. And these rats were obese. We actually tried to run them on the behavioral mazes that Heather has in her labs. And you put them on, and they don't fit on the maze, because they were hanging over, which was really, you know -- I mean, you can't even evaluate it at this point.

(Laughter.)

DR. STAPLETON: But it was just shocking to us. We never expected to find this. Certainly, again it's limited in scope. And we want to repeat this on a larger scale. But to me this is very concerning, because again the only exposure they had was in utero and/or through lactational transfer. The pups themselves were never

exposed. It was only the pregnant dams.

So this is something we're hoping we can follow up on in the future, and test this on a larger number, and look at what the internal dose is, like Linda mentioned, and try to measure metabolites in urine, so we can make some comparisons with the human population.

But based on Firemaster 550, we do know -- we do get some accumulation of the brominated components, which we can measure. It's suggestive it may be an endocrine disruptor, because we are seeing effects on thyroid hormone levels.

We also saw effects on cardio function through another collaborator at the University of Cincinnati suggesting it can be causing metabolic syndrome. It may be related to heart disease. We saw early puberty in the female pups also, but that's, as Linda said, it's associated with obesity, so we can't say if that's related to obesity or a separate effect.

But again, this obesity was the most important endpoint, from my perspective, that we observed. So, to me, suggesting it might be -- or one of its components, at least, one of these chemical obesogens. And I don't think the no observable adverse effect level should be set at 50 mg per kg. As I said, these levels were an order of magnitude lower than that value.

And just to kind of tie this up in terms of biomonitoring, I want to try to summarize what we know about the flame retardants at least, where we can monitor some of these, whether blood is the best matrix, breast milk, or urine.

For a lot of the aromatic brominated compounds, I do think blood and serum are probably the best route. I've highlighted TBBPA here, primarily because I've seen some studies where they're measuring it in blood, but I've also seen some in urine. So I do think blood would probably be better, but I've seen people trying to use other matrices to evaluate exposure.

Now, for the organophosphate flame retardants, I do think urine is probably the way to go here. They're just too rapidly metabolized in the body. The biomarkers seem to be working out fairly well right now. However, the Firemaster 550, we'll have to see what happens. We are actually working on a metabolite, a urinary method for some of the metabolites of Firemaster 550 right now. And I'm hoping that might prove to be useful in terms of monitoring exposure to that compound in the future, so we'll have to see.

I wanted to end with some -- just a few points of some of the other work we've been doing in my lab trying to quantify exposure. I've been very interested in

children's exposure to these compounds, because they're so abundant in indoor dust, and we know that dust is an important exposure pathway for children.

So working with an epidemiologist at Boston University, we conducted a study where we actually recruited a cohort of toddlers in North Carolina into a study, and we collected dust from their homes. We collected handwipes just to see what residues were on the child's hands, and then we collected blood from these children. This was 83 children.

And what we found is that all three of those matrices were highly correlated -- were significantly correlated, but the best association we observed was between the handwipes and the serum, which was encouraging for us. We actually could predict more of the variability in the serum measurements just by measuring what was on their hands than we could by looking at what was in the dust or looking at effects by socioeconomic status, age, et cetera. It was strongest predictor of their serum levels accounting for more than 30 percent of the variability.

So this has been exciting for me, and I'm hoping we can actually use this approach to measure exposure to other compounds as well, because handwipes are very easy to collect, they're very easy to store, and they have

fewer interferences than you get with serum or dust, because those are very complicated matrices you've got.

In dust, you've got a lot of soil components. You've got components from dander in mice and fabrics and materials. And in blood you've got a lot of proteins and lipids and carbohydrates. But in a handwipe, you're really just collecting some of the surface oils and whatever dust particles are on the hand. And so we actually -- it's much easier to run these samples right after you extract them. It requires fewer clean-up steps, which is really nice.

So, I mean, I'm interested in looking in the future of maybe we can characterize -- use handwipes as trying to measure the exposome, because there are a lot of chemicals that are very abundant in indoor dust. We've only done this on PBDEs and now a few other flame retardants, but it's something we have to explore in the future. So it's something that may -- I won't say may -- prove to be very handy in the future, if we're kind of getting to this exposure level in the environment, particularly for things that are more well metabolized.

And as long as we can work more on the model, so what does it mean, what's on your hand, how much actually gets into your mouth, and that's where we also need improvement in understanding of exposure and body burdens.

So I'm just going to end there, basically saying I think we certainly need more understanding of human health effects, both from TDCPP and Firemaster 550, and really more focus on exposure to these classes of flame retardants, because Linda said this very well, there are all these mixtures. We're in a chemical soup. And particularly for children who get higher exposure to these chemicals from dust, the abundance of flame retardants I think should be addressed in relation to these mixture exposures.

Then you have other things in dust, like the phthalates and the PFCs and some of the pesticides still. So it's obviously very complicated, but I'm hoping we can address this in the future. And I just want to end by thanking obviously my collaborators. A lot of my funding does come NIEHS, so I should thank Linda.

(Laughter.)

DR. STAPLETON: And thank a lot of actually my students who do all the work. So I will end there and take any questions, if there are any.

(Applause.)

CHAIRPERSON LUDERER: Thank you very much, Dr. Stapleton for that fascinating talk.

Why don't we take a few clarifying questions from the Panel and then we can move on into discussion with

both of the speakers.

Dr. McKone.

PANEL MEMBER McKONE: I have a really broad comment, but I'll save that, about the exposome. I guess I'm -- you know, the handwipes and the issue of, you know, what you're really seeing when you take a handwipe. I think it's very important, we're doing some work on dermal uptake and actually how much chemical -- there are a lot of semi-volatile chemicals where actually in theory the amount that goes into your skin is much greater than what you can get into your lungs, because you can only take in like some -- you know, less than a cubic meter an hour, but your skin can clear some -- depending upon the chemical properties it can clear the equivalent of six cubic or eight cubic meters per hour of chemical content in air, and your skin can store that much too. So it's very interesting.

So are you -- I guess my question is, are you kind of following up on why it is that the skin is effective? Is it -- you know, I mean our idea is it's kind of a nice measure of chemical potential in the environment.

DR. STAPLETON: All right. So most of my data are from toddlers. So primarily between the ages of two and four right now. And so we know that they have higher

exposure to dust from crawling around and touching things in the home. So I do think some of it's just from dust particles in the home or maybe there could be particles settling on our skin, but I also think that the handwipes might be more valuable in assessing exposure from direct contacts with products that could contain -- because I've always wondered if you're touching your couch, you put your hand on your TV, is there any direct partitioning of these flame retardants to the surface soils in your skin. And that we could account for with handwipes, where you can't get from biomonitoring, air, or dust levels.

So I'm hoping this will be nice to kind of capture more of those exposure pathways. Although, I still think there's a lot we don't know. Obviously, we're just starting to do this work now. We are assessing whether or not hand washing is immediate or how much is removed by hand washing.

And while we see some differences, even if you wash your hand within an hour, for some of these flame retardants there's no difference if you wash your hands within an hour versus, you know, four hours ago. But it is something we're looking into.

PANEL MEMBER McKONE: Yeah. Well, I'd like to talk more about this, because one of the things that comes up -- we used to work with plants, you know, vegetation

that sit out. They don't crawl around or anything. But when you look at dioxins in the cuticle level of plants, they basically equilibrate with the atmosphere. And even though the atmosphere is at really low chemical potential, the partition coefficient is so enormous, that they're the sentinels right, the lipid layer?

We aren't that much different, right? I mean, we're coated with this nice lipid layer and we walk around. So this whole idea -- you know, we really question the idea whether you even have to touch a surface to come into equilibrium with the chemistry of your environment.

DR. STAPLETON: I will say that we've done comparisons on the front of your hands versus the back of hands, and they are higher on the front, yeah. But I agree with you, and actually have had this discussion with Charlie Wechsler and Bill Nazaroff about that idea too.

PANEL MEMBER McKONE: Okay. Great. The same mindset.

CHAIRPERSON LUDERER: Any other clarifying questions from Panel members before we move on to the discussion?

Dr. Bradman.

PANEL MEMBER BRADMAN: I just wanted to ask. For the handwipes, what were you wiping them with, because

this has been an issue? I've been involved in some occupational studies and we were actually advised to avoid things, for example, like isopropanol, because it could facilitate exposure of the soluble toxicant. So I'm curious what method is used?

DR. STAPLETON: It's exactly what we used is isopropyl alcohol. We put it on a sterile gauze wipe and just rubbed the entire surface area of the hand. So I don't understand how it would increase uptake though.

PANEL MEMBER BRADMAN: This is an issue that -- the method you talked about is the standard method I think that probably EPA started with NOPE study back 20 years ago. And I was involved in a study with NIOSH where we were looking at pesticide exposure. And their policy actually was to avoid -- and also DPR here in California is to avoid use of alcohols or other solvents in handwipes, and rather use something that would -- like a detergent or surfactant that would physically, you know, remove the dislodgeable layer.

There was also some concern that use of a solvent could actually draw material out of the skin. And I actually -- I was curious I wonder if that might be one reason for the better correlations.

But I agree that handwipes in general are easier and certainly less invasive when you're talking about

collecting blood from young children.

DR. STAPLETON: Right. Right. Well, I know there has been a lot of questions asked about reverse causation, right, which is why we started doing some of the work looking at the front versus the back of the hand. So the differences we're seeing does suggest its contact with issues and not necessarily reverse causation.

But we've actually been trying to do experiments where we put gloves on our hands. You clean and put a glove on, does anything come out?

But the isopropyl alcohol is just rubbing alcohol. I mean people use it on their body all the time. It doesn't seem like it's a concern, at least for the health of the individual participating. Although, there -- whether the question is you're picking up more with the alcohol related to what would be transferred is a different issue too. Like if you put your hand in the mouth, what's going to be ingested versus what you pick up on alcohol. I mean, that's where I said we need more understanding of these hand-to-mouth contact models to really understand it.

But from the data we have so far, I find it very encouraging that it was the strongest predictor of the serum levels in the kids, but there's still a lot we need to do, I think.

CHAIRPERSON LUDERER: Okay. If there are no more clarifying questions for Dr. Stapleton, then maybe we can move on into sort of a discussion of both of the talks on the Panel. Sara, did you have a comment?

MS. HOOVER: Actually, I do have a comment, but I'm also helping -- so how we're going to do it is Heather and Linda will be right here and you guys will be speaking into this mic, which you have to apparently almost put in your mouth to have it pick up.

(Laughter.)

MS. HOOVER: Just to be aware of that.

I did want to say one thing about a comment that Heather was making in her talk. We actually asked Heather to take a look at our designated list, and see if there was anything we didn't have listed out. So that was what her comments were in her talk.

However, I did want to say that our entire category of brominated and chlorinated flame retardants are actually -- like the entire group are on the list. They're just not explicitly listed out. So we're going to take the ones that Heather identified, and we'll add them to those categories, which is a fortunate -- you know, our kind of proactive approach of identifying them as a class means we can just literally go back upstairs and type them in, and they're on the list.

And that was the same thing that's true for non-halogenated aromatic phosphates. So I just, again, a plug for, you know, looking at things as groups or classes was very helpful.

CHAIRPERSON LUDERER: All right. I know Dr. Cranor had a question. Did you want to -- we'll start with that.

PANEL MEMBER CRANOR: I actually had two questions for Linda. Let's see, one is a question that your answer might help us. We're a guidance panel for biomonitoring. Are there things that you can see or anticipate that biomonitoring might do that would lead to better, quicker protections for people? That's one question.

DR. BIRNBAUM: Well, as you know, NIEHS and NTP are research programs. They're not regulatory programs. NTP certainly directly feeds into the regulatory -- directly feeds -- okay, you have to make love to it.

(Laughter.)

DR. BIRNBAUM: Directly feeds into the regulatory agenda. And, you know, actually EPA and CPSC and DOD, for example, all sit on -- FDA all sit on its executive committee. So there's a lot of -- if new information is found, they get the information pretty quickly. And we do try to proactively let regulatory agencies and work with

them as new data becomes available.

I think in the current political environment -- maybe this isn't going to be politically appropriate to say, but I think what's happening is the federal government is kind of paralyzed, and so the States drive the regulatory agenda, which is good in some ways, because it makes things happen. But in other ways, it's very difficult, because different States have different regulations, which becomes a problem. But I keep saying as California goes, so goes the nation.

(Laughter.)

PANEL MEMBER CRANOR: Well, I appreciate that. I guess the concern I have is biomonitoring is, of course, it's always after the fact. It's always after the exposure we're trying to pick up what the exposures are. Can we improve on that, in any way?

DR. BIRNBAUM: Well, you're really moving to the issue of how do we prevent exposures from beginning. You know, so we are trying to move toxicology into a predictive science as opposed to a descriptive science. And by doing lots of screening and prioritization up front as new chemicals begin to become on the market, maybe we can identify which ones we're concerned with, and then possibly develop approaches to look for them in the environment, hopefully before they get to people, or

identify bad actors before they ever get to people.

I mean, your right, when you do biomonitoring, you already know exposure has occurred.

PANEL MEMBER CRANOR: Right.

DR. BIRNBAUM: Sometimes biomonitoring is encouraging though, when you can see, you know, after a regulatory action or a voluntary action is taken, and then you see the levels of biomonitoring drop. I mean, that's good news.

PANEL MEMBER CRANOR: My other question you just alluded to, which was the high throughput screening. I've talked to people at EPA that are very worried about that, that that will just become a kind of sham enterprise for companies to generate a lot of high-throughput screening. And, at the end of the day, you may not know false positives, false negatives and so forth. Do you have considerable confidence in the high-throughput screening you're developing?

DR. BIRNBAUM: So if you had asked me that question a couple years ago, I would have been extremely skeptical, because I think -- I mean, I kind of was used to some of the approaches where you were looking at ligand binding or antagonism and that was it.

I think when you start running through large, not only large numbers of chemicals, you know, tens of

thousands, as opposed to hundreds, at best, and you start looking for loads of different responses, and I think not only using say -- in our program, we're looking at human cells, where again we're starting to look at this variability across the human cell population. We're beginning to talk about using stem cells. We're talking about using different kinds of high-throughput testing, not only of cellular, but also there are opportunities now to do organ-on-a-chip kind of approaches, where you can actually make something that functions, in many ways, like a lung by putting on the appropriate kind of cell types, by putting in mechanical stress on the system, you can actually get cells to differentiate to give you something that very much functions like a beating lung.

The same thing kind of thing can happen with epithelium and endothelium you can actually get -- and you put in a peristaltic-like motion and all of a sudden you actually -- these cells transform and give you villi and crypt cells and all this kind of thing. So I think there's a lot of opportunities to focus as we go forward.

I personally think for the next certainly five, maybe ten years, much of this is going to be in a screening and prioritizing mode, but eventually -- I have high hopes.

Now, I should say not only are we doing the

high-throughput screening with in vitro, you know, just sometimes non-cellular systems, cellular systems, organ systems, but we're also looking at mid-throughput kinds of systems, so that we are, you know, doing a lot of work using C. Elegans, you know, which has a beautifully defined genome. Everyone of its 900, and I think it's, 60 cells or something function and a developmental profile is known.

And we're also very excited about the opportunity -- obviously, Drosophila continues to be used for many things, but a lot of work being done with zebrafish, which I happen to love. And they are being developed in really a pretty high-through put mode.

And when you deal with zebrafish, you're dealing not with a mammalian but with a vertebrate system at least, and you can look at developmental changes, and then you can actually look throughout the whole lifespan of the zebrafish, which is pretty short. I think it's like three months. So I think there's a lot of opportunity.

Through -- we are legislatively mandated to have a group that oversees a 15 federal agency member committee, called ICCVAM. And we have just -- we're in the process of refocusing ICCVAM to actually address many of the needs that the regulatory agencies are going to have and how do we use this high-throughput and

mid-throughput kind of data. So we are moving in that direction.

PANEL MEMBER CRANOR: Thank you.

CHAIRPERSON LUDERER: Dr. McKone.

PANEL MEMBER McKONE: This is my broader question. And thanks. Those are both really great presentations, and stimulated I think a lot of discussions for us.

For me, I wanted to -- and I'll reveal my bias being on the Exposure Science 21st Century Committee. And one of the things we really struggled with was the exposome and what it is, and how we're going to monitor it. And one of the really interesting things -- there are a lot of people, you know, who will say it's really only what's in this that's primary -- you know, and, of course, I think it's broader than that. It's going to be a continuing discussion.

But what I want to point out, I thought, you know Heather's presentation was just excellent in showing that you can understand -- if you really want to understand our exposures, you can't just go to the, you know, person or even to a handwipe, you have to actually look at how we make things and what we put in products. And it's bit sad that we actually have -- that she has to do inverse assessment, that you can't just go out and find out what's

in our food, what's in our toys and our products.

But, you know, I guess the question is more broadly how do we move this forward, how do we start the dialogue? Because that report just suggested where to go, but didn't give a lot of the details. And I think what I heard here today is that, you know, doing an exposome is going to be a very broad activity involving integration, even like Heather's diagram, and really have to understand men -- not even what's in our homes, but all the way upstream to what goes into making products and what are the chemicals in commerce, because those are going to be in our bodies, right? Anything in commerce, you're going to eventually find in our bodies at some level.

DR. BIRNBAUM: So that is part of the questions that need to be asked now, following the exposure in the 21st century report, following our interest. So NIEHS has formed eight cross-institute efforts on kind of some of the high priority topics that bubble to the top that are interested -- that NTP is interested in, that the intramural research program and that the extramural program, and the exposome is one of those eight.

And the first efforts are really going to be to define, not only what we mean, but what is doable, for example, in a five-year time frame. And while I -- some people want to come up with all kinds of different names,

I mean, some of us hate the name exposome to begin with. We've got too many omes as it is.

(Laughter.)

DR. BIRNBAUM: But I think the issue is, in my mind, we kind of have the enviro and then you might have the exposome, where one is outside the body and one is inside the body. And we're going to have to see what can we really approach doing. I am totally supportive of the fact that we have to understand the pathway of exposure, because that's the only way eventually you can intervene.

Whether that is going to be something that NIEHS is going to take a main focus on or whether that is really something more, for example, for EPA to focus on, through partnerships we're going to have to look at some of those issues.

So I think we're not ready yet to fully engage in how we're going to do that. But stay tuned. We're probably going to be having a series of workshops to help define some of those issues.

CHAIRPERSON LUDERER: Dr. Quint.

PANEL MEMBER QUINT: Julia Quint. I wanted to ask and maybe this came up when I was out of the room, but what is happening on the safer alternatives side of this? I mean, you're a great detective, by the way, as well as a great scientist, but that's happening more and more. Here

we're testing cosmetics, because, you know, the labeling -- the labels don't, you know, really -- aren't accurate in terms of what's in them. And MSDSs have always been a problem with the -- for the reasons you mentioned.

So I'm just wondering if there's coordination with the -- on the side of promoting development of safer alternatives and using some of these -- the whack-a-mole in the opposite direction, to maybe say that this structure should not -- this chemical should not be used period, because, you know, you'll manipulate it and we'll always be chasing after the next new chemical.

DR. STAPLETON: Well, I know that's the goal. That's what everyone wants is some recommendations on what are the safer alternatives. And I think a lot of people have the assumption that the DFE program was doing that. But actually, they're just -- you know, say what's available and this is how they range and you make the decisions.

I know Arlene is trying to do this with the Green Science Policy Institute for a lot of flame retardants. I think the problem being is we just don't have enough people testing the toxicity of these compounds. And, first, you have to figure out what they are to test. And that's the problem and that's actually the reason we

started doing what we're doing right now.

I mean, I still wonder whether there's ways -- and I'm not a legislative person at all, but why does TSCA -- or why do these chemicals have to be proprietary for the lifetime and where pharmaceuticals or other chemicals there's a certain window which you can keep them proprietary, but then you to make them publicly available.

I mean, I'm a good chemist, but I mean I'm not that great. It doesn't take a rocket scientist to do what I do. So I guarantee the competitors for these other companies could do the same thing that I'm doing to figure out who's using what.

So, in my mind, there's really not an incentive to keep these proprietary, at least for long periods of time. And I wish there could be some pushback to change the proprietary nature of all these chemicals in the first place in these products, and also push for risk assessments on these juvenile products that, as I said.

I don't know if you have anything to add to that.

DR. BIRNBAUM: Only that, you know, when you talk about like alternatives for materials in cosmetics, you start returning into, instead of EPA, you're now talking about FDA. And the different federal agencies have very different standards and very different requirements for their legislation, which is part of the problem, that

there isn't harmonization even across the federal government.

And, I mean, if you go to different parts of FDA, depending -- those different centers are very different. And we all know that the way that Office of Water acts is -- treats chemicals very differently than, for example, the Office of Toxics and Pesticides acts, and totally different than Super Fund. So lots of issues.

PANEL MEMBER QUINT: Lots of work to do.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: Yeah. Thank you. My question I guess is to Dr. Birnbaum, and that is, you know, if you've had conversations with your counterparts in the European Union in -- you know, with regard to the effect -- the extent to which the REACH regulation, you know, in that it was designed, you know, really ten years ago and is now in its -- you know, the first several years of implementation, but that it was -- you know, has been intended to -- or to ameliorate the problems -- the same problems that we have here with TSCA on the identity of substances and confidential business information, and sort of the -- you know, if has -- you know, in your -- I don't know if you've had conversations if this has started to deal with this pre-market problem and driving safer alternatives?

DR. BIRNBAUM: I don't have a really positive report to say on that. What I'm hearing from some of my European colleagues is that, you know, industry does the tests, so the tests don't necessarily ask the right questions. They're not getting, I think, as robust information as that they had hoped.

I know I'm understanding that EPA is extremely frustrated here, because what infor -- you know, the proprietary kinds of stuff in Europe that the -- I think, it's ECH or whatever the name of the organization is --

PANEL MEMBER WILSON: ECHA.

DR. BIRNBAUM: ECHA, or something -- can't share that with EPA. So all that exists are robust summaries. So EPA has to require -- you know, if they want to require some testing, they have to have it done all over again, because -- unless the industry that did the tests is willing to release it, you know, to EPA.

So it's not, I think, working quite as well. In theory, it's a vast improvement over TSCA, because it does require testing before things go on the market. But in reality, the testing may not be as robust as you would really like it to be, and the results are not readily shared.

PANEL MEMBER WILSON: Uh-huh. Thank you.

CHAIRPERSON LUDERER: Any other questions from

Panel members?

Dr. Stapleton, I actually did have a question for you as well, which relates to your comparison in the couches where you were looking pre-2005 and after 2005. And I noticed that pre-2005, it was interesting, there were about a quarter of them that had no flame retardants detectable. And I was wondering if you could comment on that group? Does that mean there really were no flame retardants used? Is it just that there were flame retardants that were used that couldn't be identified, have they off-gassed over time? You know, what do you think is driving that?

DR. STAPLETON: I really think that they likely had no flame retardants to begin with, because, to my knowledge, all flame retardants that are applicable for foam have to be additive, which means they should come out in our method. Although, we use primarily GC/MS to detect things that can be on volatilized. We would usually have some evidence if there was something else in there, and we didn't see anything in those samples.

So I just think there were some items not meeting TB 117 before 2005, and most of those were outside California, so -- but now everyone is meeting TB 117 currently. But I'm pretty sure there were no flame retardant applications in most of those, yes.

CHAIRPERSON LUDERER: Thank you.

We need to take some public comments, so I think this is a good time for that. So do we have some?

Great.

We have two comments from people who are here in the room, and none from on-line. So the first comment is from Davis Baltz of Commonweal.

MR. BALTZ: Good morning. Are we on here?

Are we on? Can you hear?

No. I better use that one then.

Testing. Testing.

MS. HOOVER: You just have to talk right up --

DR. McNEEL: Just swallow it

MR. BALTZ How about this?

If you would reset the clock, it might do.

Okay.

DR. ALEXEEFF: This one works really well. You can always borrow mine.

(Laughter.)

PANEL MEMBER WILSON: This one works, Davis.

MS. HOOVER: You've got to talk really loud or use that mic.

MR. BALTZ: All right. Well, my apologies for --

(Applause.)

MR. BALTZ: -- turning my back on some of you.

But I'm Davis Baltz and work at Commonweal. And we were the co-sponsors with our friends at the Breast Cancer Fund, the legislation that created this Program, and we have followed its progress ever since its creation.

So I want to thank Dr. Birnbaum and Dr. Stapleton for gracing us with your presence here today, and also to the staff for arranging this meeting to coincide with the flame retardant meeting.

So I just want to thank you for your work Dr. Birnbaum and Dr. Stapleton. I mean, your leadership at NIEHS and NTP has been influential, as we all know, of really stimulating research in some important new areas. And bisphenol A, as you pointed out, is one where it's really kind of come out of the shadows and is attracting the kind of attention that it really needs. So thank you for that.

And I'm going to be in and out a little bit this afternoon, so let me just get on the record right now, when the agenda items come up, about sort of promoting some of the chemicals to the priority list, certainly for the p,p´-bisphenols, as a public interest voice of support those becoming priority chemicals.

And for Dr. Stapleton, you know, we've followed your work often with Arlene Blum's assistance for a long time. And I just want to say that your couch study that

came out recently has really generated a lot of interest and momentum here in the move to revise TB 117. And we hope that, based in part on your work, that we're going to finally get a standard here that will, you know, provide fire safety without the use of toxic chemicals, and provide an upstream solution to start ridding the world of these toxic chemicals, which, in many ways, have originated from this misguided standard.

So that's really all I have to say right now. I'll hope to make a comment off and on throughout the day.

Thanks.

CHAIRPERSON LUDERER: Thank you very much.

Our next public comment is from Nancy Buermeyer of the Breast Cancer Fund.

MS. BUERMEYER: Can people hear me?

CHAIRPERSON LUDERER: Yes.

MS. BUERMEYER: Okay. I just want to see if you've tested these for flame retardants.

(Laughter.)

MS. BUERMEYER: Excellent. Okay. I also want to thank the Panel and the staff for inviting these two amazing scientists to be here today, so that those of us from the area can get a chance to hang out with our North Carolina counterparts.

And we would be -- I would be remiss if we didn't

take a minute to thank Dr. Birnbaum for her role in a recent report that was put out by a panel called the Interagency Breast Cancer and Environmental Research Coordinating Committee. Did I do good?

DR. BIRNBAUM: Yes.

(Laughter.)

MS. BUERMEYER: And they, just in February, released a report called Breast Cancer and the Environment Prioritizing Prevention.

And one of those -- one of the key recommendations in there does have to do with biomonitoring, and the need for biomonitoring to find out how we're being exposed and to prioritize chemicals to be reviewed.

And we are extremely excited about the report. We really appreciate all the work. The panel was made up of federal agency staff, scientists, and advocates. And actually our President, Jeanne Rizzo, was on that panel, one of the co-chairs. And we're very excited about all the information that's in there about the state of the science around breast cancer and the environment, the research gaps that still need to be filled, and then the policy pieces, which is the piece that I work on.

And I just wanted to say publicly to you, Dr. Birnbaum, that we really appreciate what you've done, and

we are committed to making sure this report doesn't just sit on a shelf. We really want to work with you and with Secretary Sebelius to make sure that the federal agencies do start working together. That's been a big issue for us, the fact that the FDA doesn't talk to the EPA, or the CPSC, or anyone of the number of alphabet soup that is in our federal government.

And so we really want to work, not only to make sure that the federal recommendations are implemented, but also go to decision makers in Congress and other places to make sure that some of those other policy recommendations are realized, including reform of the Toxic Substances Control Act, which is something that folks have mentioned quite a bit here.

And I did want to just point out that Senator Lautenberg and Senator Gillibrand did reintroduce the Safe Chemicals Act to amend that -- to reform that bill yesterday. So introduction is one small step in a very long congressional process, of which I am way to familiar with. But we've -- if we don't have a bill, we can't begin the conversation.

And so hopefully all of the voices that are calling for this kind of reform and really bringing environmental health to the fore and the work that Dr. Stapleton has done, and the fact that she testified last

year in Congress in support of the Safe Chemicals Act, will start to bring these issues forward to the American people and to Congress.

Thanks.

DR. BIRNBAUM: Well, thank you, Nancy. I just wanted to let everyone know that if you're interested in seeing prioritizing prevention, the IBCERCC Report it does live on our website and you can find it.

CHAIRPERSON LUDERER: Thank you very much for your comment.

Do we have any other comments, questions, discussion from Panel members?

No. All right. Well, before we all -- yes, Dr. Lipsett.

DR. LIPSETT: Okay. Is this okay?

So this one worked for me before. So this is a question for Dr. Birnbaum, but with respect to Firemaster 550. And up until Heather's recent publication was just like in the last month and a half, that she talked about in her presentation, there have been no other independent toxicology studies of this mixture at all. And yet, people in this country are universally exposed to it.

And I was just wondering what impediments do you have, say, for testing this kind of mixture where there are proprietary ingredients? And, you know, Heather and I

guess it was Susan Klosterhaus who got the original sample as a fluke from Chemtura --

DR. STAPLETON: I'm sure they regret that now.

(Laughter.)

DR. LIPSETT: Yeah. They won't sell her anymore. So how can you --

(Laughter.)

DR. BIRNBAUM: I should say when it was Great Lakes, Chemtura gave us BDE-47. So occasionally.

(Laughter.)

DR. LIPSETT: Well, so, if you were to conduct say a test of like a -- in the NTP program for this mixture of Firemaster 500, what kinds of issues would you face in dealing with ones that have these kind of proprietary ingredients?

DR. BIRNBAUM: Well, the issue is is that we don't have testing of chemical mixtures. I think it could be. What I would urge is that somebody nominate it to us. You just go on the NTP website. There's a nomination form. I think with the data that Heather Stapleton and Patisaul, both of them, have come up with, it certainly raises the level of concern.

My personal lab is actually -- we'll be looking at some of the pharmacokinetic behavior of the two brominated compounds, not the phosphates, which I know

Heather thinks may be very, very problematic. But I think that this would be an interesting chemical.

I should tell if you go on again the NTP website, and you put in flame retardants, we have a longstanding program looking at flame retardants, both historically where we tested the PBDEs, where the PBDE -- the deca was tested and shown to be a rodent carcinogen many years ago. The penta commercial mixture, those studies are in final pathology review. Let's just say it's not a nice chemical.

TBBPA, those pathology tables went on line exactly a month ago. And TBBPA does cause both benign and malignant tumors in rats and mice. And TBBPA has completely flown under the radar, which is, I think, of great concern.

And then we have a whole effort looking at a number of the different alkyl phosphates. About 20 of them or actually even more that have been going through a range from the very, you know, short-term genetic type tests up through some of them are going through subchronic kinds of studies and eventually some will probably go through full two-year studies.

So nominate Firemaster 550 as the mix. The issue will be will Chemtura give it or allow NTP to buy it?

DR. LIPSETT: Well, it will be nominated by

somebody in this room.

(Laughter.)

DR. LIPSETT: Thank you.

CHAIRPERSON LUDERER: All right. Any other questions, comments?

All right. Well, then to wrap-up this morning's session, I was asked to do a short summary of the presentations and the discussions.

So Dr. Birnbaum stressed I think several themes in her presentation. She talked about the tens of thousands of chemicals in our environment, and stressed that these include not only the man-made chemicals, which we were mostly focused on today, but natural chemicals, as well as man-made chemicals that we take on purpose, such as drugs.

She talked about the developmental basis of adult disease, and the important realization that life-long health effects can ensue due to prenatal or other -- or early life exposures.

She also talked about the concept of endocrine disruption and the low-dose hypothesis. The Endocrine Society defines an endocrine disrupting chemical as a chemical mixture that interferes with any aspect of hormone actions. So we have come to appreciate that endocrine disruptors are broader than just acting via

hormone receptor binding.

And she stressed the important -- the understanding that endogenous concentrations of free hormones are actually in the picogram to nanogram per milliliter range and that this is very similar to concentrations of EDCs to which humans are exposed.

She also highlighted -- she talked about the many animal studies that have shown exposures of various EDCs in these low concentration ranges, and that recent human studies really have started to find effects of the same chemicals on many of the same endpoints in human populations. And she highlighted some studies associating, for example, persistent organic pollutant exposure with diabetes risk, polybrominated diphenyl ethers exposure with neurodevelopmental effects, alteration of thyroid homeostasis reproductive, effects and bisphenol A exposure in studies of assisted reproductive technologies showing associations with the decreased numbers of eggs retrieved and eggs fertilized.

She also mentioned that there's an April 23rd webinar on a new OHAT methodology that we might be interested in for analyzing dose responses, particularly focusing on low-dose response.

And she talked about new directions at NIEHS, such as looking at the exposome or the totality of

environmental exposures for an individual, studies of mixtures. And Dr. Birnbaum highlighted PAHs as an example of some mixture studies that are going on at NIEHS and its grantees, and talked about high-throughput toxicity testing, which also came up in the discussion on the Tox21, the thousand genomes project, which is in vitro, using cells lines predominantly, and the diversity outbred, which is a population based mouse model.

During the discussion, Dr. Quint and Dr. Wilson both raised concerns that in occupational health we kind of, in some ways, seem to have fallen behind, in terms of -- in particular thinking about lower exposures, and asked about whether there is -- whether NIEHS is working with NIOSH. And Dr. Birnbaum talked about some initiatives, including looking at nanoparticles and their toxicity.

Dr. Cranor asked about high-throughput assays and whether they're ready for prime time. And Dr. Birnbaum had some, I think, very encouraging comments about that, and also mentioned some interesting mid-throughput assays, such as in model organisms that are non-mammalian, C. Elegans, and zebrafish as examples.

Dr. Stapleton discussed new research on exposures to and toxicity of the non-pentaBDE flame retardants. And she talked about much -- a variety of different research,

but a lot of it really, I think, as she said, showed that the California flame retardant standard, the California TB 117 really seems to be driving flame retardant use nationwide, not just in California, which is important, and something that this Panel has, I think, talked about.

And she described her recent work screening couches and baby products for flame retardant. Some of the most commonly found flame retardants in baby products included TDCPP, Firemaster 550, and V6. And couches similarly also contained TDCPP, very commonly in Firemaster 550, but also pentaBDE. Although that was primarily in the older couches.

And she also identified two new organophosphate mixes in both types of products. And she also talked about TCEP being -- making up 14 percent by weight of V6, which is a known carcinogen. And that is obviously of concern.

And she also described a recent study she had done in collaboration Dr. Patisaul, an in vivo study of gestational and lactational exposure of rats to Firemaster 550 at levels more than ten-fold lower than the current NOAEL.

And this study showed effects on dam thyroid hormone, thyroxine, increased pup weights and obesity, increased ventricular wall thickness in the males, early

puberty, constant estrous in the female offspring.

And she stressed the importance of method development for urinary metabolites of Firemaster 550 and other new flame retardants, and also talked about an exciting new methodology she's developed to study environmental exposures in children using handwipes.

And talked about a study looking at serum PBDE concentrations, and how that they are very highly correlated with the handwipe PBDE concentrations, and, in fact, accounted for 30 percent of the variability.

And with that, I would again like to thank our speakers very much for their excellent presentations, and Panel and the audience for discussions.

And we'll now be breaking for lunch and we have an hour for lunch. So it is just about noon, so we'll reconvene at is 1:00 p.m. promptly.

(Laughter.)

(Off record: 11:59 AM)

(Thereupon a lunch break was taken.)

A F T E R N O O N S E S S I O N

(On record: 1:13 PM)

CHAIRPERSON LUDERER: All right. I think we need to get started. We're running behind. Apologies for starting late.

(Thereupon an overhead presentation was presented as follows.)

CHAIRPERSON LUDERER: All right. I'd like to welcome everyone back from lunch. And the next item is going to be an update on Biomonitoring California activities presented by Dr. Michael DiBartolomeis, Chief of the Exposure Assessment Section, California Department of Public Health and lead of Biomonitoring California.

Dr. DiBartolomeis.

DR. DiBARTOLOMEIS: Well, thank you, and welcome back from lunch. I hope everybody had some nice something to eat.

My job in the next 15 or so minutes is to make sure you're still awake for the important stuff that's going to come later in the day. So we're now -- we're now dovetailing. We're going into that part where the Program can go through its progress, accomplishments, and get into some sort of technical results, et cetera.

So I'm going to just start out superficially. And then a lot of the things I'm going to touch on are

going to be delved into in more detail by Dr. Petreas, She, and Ms. Dunn.

But before I do that, I just want to -- it's really nice -- and I know a lot of the OEHHA people have probably gone back upstairs, but to have the opportunity to now work closely again with my colleagues and friends over at OEHHA. And some of the people -- we were talking about who hired whom. Some of the people in the audience this morning I hired, some it's kind of made me think, A, I'm getting older --

(Laughter.)

DR. DiBARTOLOMEIS: -- and, B we've done well. We got some really great people in here. So I'm going to go ahead and try to get through these in a fairly quick manner.

Basically, this is following the same kind of format you've seen before. There's nothing really different about what I'm going to be doing here. I'm going to concentrate a little bit on the progress -- am I too loud?

I'm the opposite of the other problem.

I probably don't even need this. Most people -- yeah, like Sara and I don't actually need microphones.

(Laughter.)

MS. HOOVER: It's true.

(Laughter.)

DR. DiBARTOLOMEIS: So I'm going to cover just quickly the accomplishments and the progress made to date on the three complete -- the projects that we do and completeness with biomonitoring, and then cover a couple of things that have -- reportwise that we have gotten out. Then I want to get into a little bit about some public -- how we're going to get some results out to the public. And then just really quickly touch on some future -- some ideas for future directions.

As usual, we say any staffing changes, and Amiko Mayeno has left the Program, and we wish her well. And we thank her for her service.

And, of course, I'm here now, but that's -- we already know that.

(Applause.)

DR. DiBARTOLOMEIS: You know, I'm just going to keep saying that so I get applause.

(Laughter.)

DR. DiBARTOLOMEIS: So let me remind you, because I know most people probably have this memorized, but in case you don't, back in November -- and this is the Mothers and Infants Exposure -- Environmental Exposure -- something -- Project. Thank you.

You can tell these things happened before I --

this is lot of stuff that's happened that I'm catching up on. But in November, we had just returned the first set of results to the participants. And I think we had just been starting analyzing the second set, and then, of course, the returning of the second set comes later.

Now, today, we have completely analyzed the second set of chemicals and we're very close to having the results returned to the participants. We're thinking May. It could be, you know, somewhere in that time frame.

Also, there's a new box. I wish I had a pointer, but hydroxy BDEs. That's another set of chemicals that initially the principal investigators wanted us to analyze, but there was some methodological problems -- oh, wow. I ask and it shall happen.

I might not need it anymore, but I'll -- and so the technical difficulties have been worked out, and so they're going to go forward, the labs are going to go forward to analyze those in these samples. And so there will be a third results returned at some point, but we don't have that up there yet, because it's kind of too far into the future. Maybe Myrto is -- yeah, she'll touch on.

So in terms of the panels and the chemicals that were able to analyze, you know, in November we were complete all the way up till we get down to the dialkyl phosphate metabolites and metals. If you look over on the

right-hand side that's where we are. Now, those are now complete. In fact, the only thing we have now pending are the hydroxy BDEs, which is really great. I mean a lot of progress made.

The FOX Firefighters study, which is the occupational exposures to whatever firefighters are exposed to. Back in November, we actually were working on the second set of results going back and analyzing -- I'm sorry we were analyzing the second set of chemicals. And, let's see, we're still doing that. It hasn't been completed yet, but we did start the -- no, sorry. Let me go back to that. Oh, not yet started.

So last -- so that's interesting the colors. Okay. So the second set of results returns has started, but we haven't gotten all the results yet from the second analysis. So definitely by the next meeting we'll probably be having those boxes completed. And in terms of analyses, you'll see that the one change that's crossed out is that after some discussion with the principal investigators, and with the labs, we decided that the -- not to concentrate on those particular phosphate -- pesticide metabolites for this particular group. So we dropped that. We did complete the metals in urine. And arsenic speciation has made progress, but it's in the review stage.

And for the pilot BEST project, and pilot BEST is pilot and then there's going to be the second part of BEST. So this is just the pilot part. Back in November, we had just completed the first set of analytes with a bunch of metals. And I should probably mention that the metals that we reported back in November we had the wrong metals up on the -- so if you go back to your old notes, you might notice that the metals are different. We corrected that on this version.

Disclosure. Transparency.

And so where are we now?

The first set of chemicals has been returned. It was returned actually awhile ago in December, and let me see. And we have also abstracted the information from the medical records. That is complete. And we are now into the -- analyzing the second set of analytes.

And then in terms of chemicals, you'll see that the PBDEs have been completed. They were in progress in November. They're now done. And we actually have perchlorate in progress. I thought it was close to being complete, but I guess we're still working on that one, but it's made progress.

So okay. That gets us through those three projects.

What else happened?

Well, we have a mandate to provide a legislative report to the legislature. And I believe we have three that we have to provide, and we provided one -- I don't know when. I haven't actually looked at -- every two years. Okay.

So this is the second report. And that's what it looks like. That's the cover. And it was disseminated to the legislature in early February 2013. And I don't expect you're going to be copying down that website, but you can probably click on it if you have the electronic version. And that's where you can find it, and I'm going to go -- just the next slide is a little bit on the table of contents and what you would find inside of there.

But I just wanted to mention that we've already started the third report, which is due at the beginning of next year. So there's never any kind of end to these things.

And so what do you see in the legislative report is probably fairly structured and consistent and more than likely we'll be following the same table of contents for the third report. You'll see introduction and background, of course. And then there's program structure and resources, where information is provided about the sort of current state of the sustainability of the Program and the staffing and that sort of thing.

Then there's a whole chapter on the Panel, the Science Guidance Panel. And there are a lot of little subchapters and stuff I didn't bother -- it wouldn't have fit on here. Then we go through various -- the projects and the study design and some results are probably provided in the appendices. Then there is status updates on the laboratory.

How we're involving the public is another chapter. And then there are some conclusions and recommendations. And I can just sort of quickly -- excuse me. I have to catch up with my notes.

The other thing about coming back here is that I realize I now have to wear glasses to read.

(Laughter.)

DR. DiBARTOLOMEIS: And when I first came to the State, I didn't have to. I had perfect eyesight. I'm not saying that there's a correlation between working for State government and losing your sight.

(Laughter.)

DR. DiBARTOLOMEIS: I can say there is probably about losing your brain.

(Laughter.)

DR. DiBARTOLOMEIS: So in terms of some conclusions, in this legislative report, the second one, we definitely have made significant progress in increasing

laboratory capability and capacity to analyze environmental chemicals in human tissue.

There have been several collaborative efforts. Those are spelled out in here. And these are still ongoing, of course. There was significant progress made in targeting biomonitoring studies and surveys representing populations at large. And there has been a specific instance where biomonitoring has led to more than just detecting chemicals. It's actually outreach and education and potential policy changes when mercury was discovered and people who were using skin lightening creams.

And there's -- we're going to talk a little bit more about cosmetics at some point, so -- but that -- you know, that was an actual concrete application. We were talking a little bit this morning about when does biomonitoring kind of go into public health policy and public health application.

And then ultimately there's been an expanded outreach and materials for communication biomonitoring results, both to individual participants, as well as to general public.

So another report that was issued was our progress report to the Centers for Disease Control. And we highlighted -- this is really a major accomplishment.

We now have, of the original proposed methodologies, a hundred percent have been completed. So that's a really major accomplishment. So my kudos to the labs. That's really great.

And also, what we just talked about, the three main projects. So obviously a lot of progress has been made there. In terms of proposed activities that are that report, just to kind of go through these really quickly. You probably have seen these before.

And the Program evaluation has actually started. And I don't know if I want to go into a whole lot, because I don't have a lot of time, but, you know, if you wanted to ask me, I can answer some questions. But that Program evaluation is part of what we proposed and agreed to do with CDC.

We have finalized and disseminated the report of the county health officers and environmental health officials. And we think it's going to be ready to be posted and disseminated and made public in August. We're continuing to explore the feasibility of using those genetic disease screening program samples, and we're going to hear a little bit more about that later.

And we're continuing to explore methods development for other chemicals. And specifically I know this Panel had discussed synthetic musks and personal care

products. And I believe that we'll hear a little bit more about that as well, but that's something that we are pursuing.

We're continuing to work toward a capability for non-targeted laboratory analyses. That's another way of just saying we are going to be looking at unknowns, and starting to develop methodology to do that, rather than just going in and going -- going to where the spotlight is, starting to look away from where the lights are.

And specifically for chemicals, and I think this is going to be mentioned as well later, we're exploring and developing methods for BPA, analogues and derivatives, and non-PBDE flame retardants. And we heard quite a bit about that this morning from our two guests. And we're continuing to participate in proficiency testing programs, both with CDC and other programs.

In terms of public availability of results, this is a huge emphasis for this program. We think, at this stage, it is a very high priority for this program to get results out to the public. And we're going to see some results a little bit later from the teacher's study -- California Teachers Study.

But, you know, I can't emphasize this enough, so we do get the results back to the participants, but in -- you know, we need to start getting results to the public,

and making this Program visible, and getting these results out scientifically, as well as to the general public for other means.

So there are ways to do that. We're going to see a presentation about website design -- about the revised website from Amy, a little bit later. Publication is always a way to go. And you can publish, not only in scientific journals, but in lay journals. So we have to be thinking through that. But we also are going to be posting the results on the website.

So one of the things that the Panel wanted apparently was, well -- how would you actually -- what would you present?

And so we put together, and this is Lauren and others -- and Laura and others put together a template, which would basically give you an idea of the kinds of things that we would post, not necessarily all of them at once, or not necessarily in this order, per se. We might expand or take away. But essentially we're talking about some kind of central tendency measurement, geometric mean with confidence intervals.

Then you could provide a range of results in terms of percent -- of selected percentiles. We would have some kind of statistics on detection frequency, you know, a hundred percent, probably greater than 50, you

know, something along those lines. And then something very important, what is the limit of detection, so we have an idea of what -- you know, what these levels that we're reporting are in terms of how low can we ratchet it down.

I'll let you -- I know that's in your notes. I'm sure there's going to probably be a little bit of discussion about that, but I do need to move on otherwise I'm going to get the hook.

But that's sort of -- and the kind of template itself can change a little bit. And, at some point, we can also have comparisons to other data like NHANES, and that we have, you know, structure for that, too.

So that concludes the part of the session that I feel like everything happened that I'm just reporting what other people did. So in the next two minutes, if you can just indulge, when I came here and actually during my interview process, I thought one of the things that I should be doing is bringing my own personality to this program. Sorry, for those who don't want that.

(Laughter.)

DR. DiBARTOLOMEIS: But for those who think that's a good thing, I had to start somewhere. And, of course, I do have visionary thoughts about what -- where I think this program can go, but I wanted to go back and see what had been discussed already.

So I went to the two sources, the SGP meetings in the past, and I went to some internal meeting minutes that I found from probably stuff that's buried and nobody knows much about, but some retreat off-site sort of things from the Program planning people.

And I pulled out things that I thought really had a lot of merit, and had been -- seemed to have generated a lot of interest, and I have interest in, which is important for me. And I listed them up there in four bullets as things that we want to go forward to discuss internally and then eventually with the SGP about ways where this Program can grow, where it's going to be in the future. When you get to our age, my age, you start thinking about future and what you're going to leave behind.

And so these are the sort of areas that I thought -- and, you know, I can just quickly read them. Obviously, sustaining the Program. And almost everything that we do feeds into that, so we just have to keep that in mind.

There is -- we talked a little bit about risk assessment this morning, and about how biomonitoring can fit into the context of quantifying public health impact and those sort of things. I broadened it a little bit. I don't want to say risk assessment. I just want to say

biomonitoring does have a role in evaluating impacts of chemicals on human health and probably the environment as well, if we wanted to expand biomonitoring to be what's in animals and, you know, et cetera.

Plus, there's also the upstream versus downstream kind of events. So biomonitoring might help you get at something that might be happening sooner versus waiting until we see some impact down the line. That gets a little bit toward the prevention side that you were talking about, Carl.

And then it would be -- not make any sense that we wouldn't and -- one minute? I will definitely be done in one minute. That we would definitely want to continue to link biomonitoring and our results with what we're finding in the environment and the workplace. And for my particular interest now in consumer products. So I think that, you know, there would be no reason to do -- go away from that, but we have to actually, I think, have a plan of attack, because you can actually get scattered and really watered down, if you don't -- if you start jumping at every fire.

So you really want to have a plan. And then finally, George mentioned this this morning. I have had a longstanding interest in Environmental Justice. It started when I ran something called the comparative risk

project. 21st century plan for California's environment. And I formed a committee on Environmental Justice. It hadn't been done before, and I took a lot of flack for it.

So because I took enough flack for it, I have just -- it has become something that I have really been bonded to, and I take it really seriously. And I think there is a definite role for biomonitoring in Environmental Justice considerating the work that we can do to inform the movement and to actually use biomonitoring to lessen the impact on overly burdened -- disproportionately burdened populations.

So with that, I'm going to stop. I do have some more specific ideas here, but I'm going to let the discussion take wherever it's going to go.

Thank you.

(Applause.)

CHAIRPERSON LUDERER: Thank you very much for that update and for your thoughts on future directions.

Do we have any clarifying questions from the Panel before we go to public comments? And then we'll have more discussion from the Panel afterwards?

Dr. Cranor.

PANEL MEMBER CRANOR: Michael, you mentioned the second bullet on the future directions. Do you have anything more specific there?

DR. DiBARTOLOMEIS: Not, at this time, in terms of -- I feel like I don't want to get ahead of the Program. I promise, though, that there will be a future meeting where there's going to be something -- a much more in-depth discussion about this. And I would like to get -- there's a lot of expertise just in this room, and maybe we can find some others outside too, to really delve into this a little more, because it is something that we're talking about a paradigm shift.

You know, we hate that word, but you know what I'm talking about. Everything is really risk-based now, and we have to start thinking about where we're going -- where does biomonitoring take you that maybe takes you out of that paradigm into something that is quicker, more predictive, lessens the burden on government. You know, all those sort of things that we really have to think about as we move forward.

PANEL MEMBER CRANOR: Right. I might add, not only are things risk-based, but they're always risk-based well after the fact. And unfortunately, biomonitoring is, after-the-fact, detecting things. And so it would be an imaginative advance to figure out how we can do that with an eye to going forward.

CHAIRPERSON LUDERER: Dr. Quint.

PANEL MEMBER QUINT: Yeah, Julia Quint. You have

consumer products, and I can't help but think that we have this safer alternatives regulation that's hopefully moving down the line. And one of the triggers for -- you know, there's two things, you want to have exposure as well as the health impact part of it driving the choices of what priority products are out there. And biomonitoring is one of the exposure triggers for the safer alternatives project.

So my question is, are there any -- I'm sure you're talking to DTSC about this, but is there anything more formal in terms of how they may -- you know, interactions between your two programs? This may be too -- you just got on board, so you may not know this.

DR. DiBARTOLOMEIS: Well, first of all, I have been serving as a consultant to DTSC on promulgating the regulations. And that's official with my CDPH hat on, so I can actually say that.

So I do know kind of what is the thinking about how they're going to identify priority chemical product combinations. And biomonitoring is definitely on the table. And I think there is going to be a link between, you know, the two programs. We are trying to meet with Debbie. Unfortunately, we've kind of had to push -- things have happened in the past couple of months at DTSC that have kind of pushed our meeting, but we do want to

have a strategy meeting about how we can work -- and we're going to do the same thing with OEHHA.

There's three departments involved here. And these three departments we work really well at the technical level. We also have a level where we're thinking internally about things, but we haven't really had the high level discussions yet, and I think we need to do that.

PANEL MEMBER QUINT: Can I just -- yeah, because I think one of the things being retired, I get to dabble in a lot of different programs. And I think, to me, sometimes it's disconcerting how still siloed everything is in terms of policies and not integrating those things. So I think we have environmental health tracking, which has been linked to biomonitoring in a way.

And so it would be really nice to have all of these programs at least communicate, you know, and set -- try to set priorities somewhat -- to the extent that their mandates for their programs allow, but to try to integrate more, because I think it's much more effective.

DR. DiBARTOLOMEIS: Well, I'll just say thank you for that comment, and definitely something that we'll bring forward and discussing it in length.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: Thank you, Michael. And I

guess I'd be interested in hearing your perspectives on, you know, how biomonitoring does sort of intersect with your experience with Environmental Justice and all of that work.

DR. DiBARTOLOMEIS: Probably the best way I can respond to this is to just think about the groups that I've been working with -- or I had been working with when I was head of the cosmetics program, like the Healthy Nail Salon Collaborative. And really the basis for their concern is that they're using chemicals in the workplace that either are not well-regulated in a workplace or they are not on labels. And so they don't know they're being exposed to them. And these are people whose livelihood is to work in these non-vented, not very well regulated work places. They're usually people of color with, you know, low income.

And so I think it's sort of a natural red flag for me that you have, you know, a group that really needs something besides whatever they can raise their hand in a public forum and say, you know, help us. So biomonitoring and other environmental monitoring kinds of work is one way to really hone in and define an exposure for a defined population that clearly has all the other things that you would want to look for in an Environmental Justice community that is definitely the impact -- you know, a

higher impact.

So one of the things I'd like to -- probably will put forward, quicker than something else, is to have maybe a meeting -- maybe either the next meeting or the meeting after, where we actually have cosmetics be the primary -- or the personal care products be the primary topic. We can actually have somebody from the Healthy Nail Salon come here. We can have somebody from the cosmetics program come. And we can talk about it in an Environmental Justice context as well.

So I think that some of this might move forward in that regard. It just makes a lot of sense to maybe pursue that population because we have so much information that we can -- a lot of work has already been done, but yet we have the information coming from the cosmetics program, the Cosmetics Act. We'll have -- by then, we'll the consumer product regs out, and then we have the biomonitoring.

We're going to hear a little bit more maybe about some other analytes. So I think that's sort of primed for a future direction.

PANEL MEMBER WILSON: Great.

DR. DiBARTOLOMEIS: And the other thing that's going on with the Environmental Justice. Of course, George mentioned it this morning is the CalEnviroScreen.

And that's going to be coming up to speed, I think I heard, in April, John Faust told me, but maybe -- some time --

DR. ZEISE: Very soon.

DR. DiBARTOLOMEIS: And that's going to be another thing I think we need to explore. So we could also probably even have a session devoted just to Environmental Justice. So sorry for the long-winded answer.

CHAIRPERSON LUDERER: Dr. Kavanaugh-Lynch has a question, and then we'll take some public comments after that.

PANEL MEMBER KAVANAUGH-LYNCH: Thanks. It's very exciting to see these future directions, at least we know that you're thinking about them and have taken the input that we've given in the past about those.

Written in between the lines here -- I'm sure it's here. The more you talk, the more I believe that. But what's not explicit is what was written in the legislation about the community involvement in this program.

And so I can't imagine Environmental Justice work without community, but it's not -- I'd like to see that a little more explicit in the future directions.

DR. DiBARTOLOMEIS: I think you actually raised a

really good point. It is part of it, but I keep forgetting that most -- many people who may not realize it, public involvement is just a key component to Environmental Justice. It's like something that connects the two. You just have to have it, but it should be more explicit, and it is definitely -- believe me, that is something that we would have to be talking about.

Now, having said all of this, going back to that first bullet, sustainability for the Program. Anytime you're involving the community, and anytime you're doing a study, whether it's small or large or whatever, resources do become an issue, and we have to really consider those things, too.

So that's why, you know, a part of -- we have a lot of great ideas, but if we're going to really do this and do this right, we also have to make sure that this program can sustain that, and that the State of California supports it.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: This also relates actually just to your last comments, and the plan for sustainability. Another piece that was in the legislation was a representative sampling of the California population. And, you know, over the years, that's been -- it's basically been a consensus that there's not the

financial resources. It's just mentioned to accomplish that. I don't know if the State budget is doing a little better, and I wonder if we can think about how to move forward to also accomplish that and whether that should be part of -- at least if it's not part of the future direction, there should be kind of a self-conscious admission that we don't have the resources to accomplish that core, almost a mandate.

DR. DiBARTOLOMEIS: Well, let me respond first by saying, I'm going to pass my briefcase around and you can just sort of start throwing in your dimes and nickels.

(Laughter.)

DR. DiBARTOLOMEIS: In actuality, yeah, I mean that's precisely what we have to be thinking about. If we're going to be thinking small, big, medium or whatever, we have to make sure that there is some kind of a funding resource for this, whether it's some avenue that we can't think of right now, because it has been created yet, some mechanism, or whether we go through the same old, you know, routine.

And we're not giving up on getting federal funds and those sort of things either, but, you know, it is something that really plagues, not only this Program, but some of the other programs that I'm attached to, like the Green Chemistry and the Cosmetics Program. These are --

it's really -- it has been tough times. And you are right that there seems to be some improvement in the economy in California, but, you know, there are other people in this room who I know can speak to this a little better. It's not necessarily that the legislature now is just saying -- and the Governor is just saying, okay, let's spend.

So we're kind of in that weird place, where things are a little bit better, but yet we -- there's still going to be a lot of competition for the same dollar.

PANEL MEMBER BRADMAN: Yeah, and I think we understand that. But I guess if we're going to -- if we're not going to do that, we should not do it in a kind of a transparent and self-conscious way.

DR. DiBARTOLOMEIS: Yeah.

CHAIRPERSON LUDERER: Okay. We have a couple of public comments. So thank you very much, Dr. DiBartolomeis.

We'll take some public comments and may --

DR. DiBARTOLOMEIS: I don't need to stand here anymore.

(Laughter.)

CHAIRPERSON LUDERER: So our first public comment is from Renée Sharp from the Environmental Working Group.

MS. SHARP: It's kind of confusing which way you

face.

(Laughter.)

MS. SHARP: I'll just sort of go back and forth. So I'm Renée Sharp. I'm the Director of Research for the Environmental Working Group. And we're a nonprofit environmental research and advocacy organization based in D.C., but we have an office just a few blocks that way in Oakland.

And I just wanted to really reiterate a number of the comments that have already been made about how much we appreciate this whole Program so much, and also just the effort that the Panel puts in to having a great discussion and pushing the Program forward.

So, that said, I also was really particularly excited to see Michael's slides on proposed activities and future directions, because as much as I love the current Program, I was particularly excited, and just wanted to note, about the possibility of identifying and quantifying unknowns.

It feels like, you know, this Program is already pretty cutting edge, but it could really -- it could be even more cutting edge, and that would be really exciting. I mean, one of the things as an organization that's actually done quite a bit of biomonitoring ourselves, one of the things that we have really experienced is that

while we have something around the range of 80,000, a hundred plus thousand chemicals in commerce, the number of them that we can actually -- that we have methods for to detect in water, much less in urine or blood, is remarkably small.

And there's, you know, quite just -- statistically speaking, it's quite likely that there are a number of chemicals that basically -- you know, that are potentially harming our health, that we just don't even know how to detect. So if this Program could help support, you know, more of the method development, and more of the identifying of the really cutting edge, up and coming threats or threats that we just haven't identified, that would be a really great outcome for this Program.

And then I was also very excited to see many of the future directions, including -- really including biomonitoring as an element of the broader context of assessing chemical impacts on human health, and the source exposure relationships, and also Environmental Justice.

I think these are all really fantastic future directions, and I'm excited to see where it goes.

Thank you.

CHAIRPERSON LUDERER: Thank you very much for those comments. And our next commenter is Diane Graham from Keller & Heckman.

DR. GRAHAM: I'm actually speaking as an analytical chemist and a member of the public. And I've been following this Program for a number of years, and I'm really excited that it's a priority to get results out to the public, because I am very interested to see the results of this project. And I'm really excited that we're going to be able to finally get the data and actually be able to see it ourselves.

So thank you.

CHAIRPERSON LUDERER: Thank you very much.

All right. Our next agenda item, if we don't -- or do we have any additional comments or discussion from the Panel about --

MS. HOOVER: Yes. Oh, this is working better now.

Yes. In fact, if you put up the slide on the template, we have a few -- just a little bit of -- let's see. This is time for Panel discussion now. Those original were clarifying questions.

Anyway, I did want to just go back to the results template and say a little bit more. And Lauren and Laura are both in the audience. So we had an internal work group to develop this. And I just wanted to note it, because we actually went back to the previous Panel discussions and paid attention to what are the key

elements that should be in the results template.

So, first of all, just Panel impressions would be good to hear. You know, obviously, brief. We don't have a lot of time, but your impressions. And also, another note for you is that we actually have a -- we have a service order that hopefully will be approved with our web developer to actually do, instead of just a flat posting of a PDF, to have a fancier version on the website that's actually embedded as a template within the website. So I just wanted to note that's some of our work. I don't know, did you guys want to add anything?

Okay.

CHAIRPERSON LUDERER: Dr. Quint.

PANEL MEMBER QUINT: Julia Quint. Will there be -- I think you -- when you said it won't be just a PDF, does that mean that you will be able to click on things and get explanations, or will there be --

MS. HOOVER: Yeah.

PANEL MEMBER QUINT: How will that work?

MS. HOOVER: Okay. These mics are confusing me. Okay. Yes, we have different possible options. So where it says definitions, we're probably going to do -- we were originally thinking about a rollover thing, where you rollover and it pops up, but now I think we're talking more about linking terms to a glossary. So, you know, it

will be like clickable, and then it can go to a term.

PANEL MEMBER QUINT: Right. Outside of just defining terms, I'm wondering if -- and this can get tricky, because this is exposure and it's not health, but for a lot of people, this is meaningless in terms of why are we -- what do I care -- I mean, what does this mean that this is in somebody's body?

So if you could -- are you linking to the CDC fact sheets or anything like that?

MS. HOOVER: Oh, yeah. Well, you'll see this in Amy's and Laurel's presentation. You'll see the context for how -- all the context. Yeah, we've thought a lot about that.

Just as one added note though to -- if I maybe misunderstood your original question, yes, part of the -- this is like the initial push out to get it on the website.

However, there's definitely an intention to do, you know, like interpretive pieces that would be understandable by the general public, when we have results. So that -- you know, that's a priority as well.

PANEL MEMBER QUINT: Yeah, just one final thing. I'm not sure how this could be done, but it would be interesting to see, in some sort of evaluative process, you know, the impact of this information. I mean, I know

you can look at how -- you know, how many clicks you got on the site or something like that, but I think we're probably the first Program that will be doing something like this, right, publishing -- well, CDC does it all the time.

MS. HOOVER: CDC does it. I mean, I think -- you know, we're going to have -- we have certain testing, you know, of the website planned and a possibility for input. I'm just looking to Amy for this. She can maybe comment on it, but we're going to have ways where people can give input and so forth.

PANEL MEMBER QUINT: I guess, you know, just questions. If people -- whether they understand it or don't understand it, I mean, is there a possibility to do some sort of minimal evaluation of, you know, how this is working in terms of the communication part of it?

MS. HOOVER: Yeah, I mean, I think -- I don't know, Amy, if you want to respond to that more than I can, but I think that that is essentially planned.

MS. DUNN: Well, I think it's a great thing that you're raising that, because we do have testing that we're doing for the website, but this is, in a way, coming a little behind the first part of the website development, and we're just getting ready to work with our web developer on this piece. And so I think, you're right,

that we really should build that in.

PANEL MEMBER QUINT: That would be great, actually, I think, if you could.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: So I had a clarifying question then about the reporting of the results for the different programs. And if specifically the report -- the results are obviously going back to the Program -- you know to the participants. But are these results also going to be made available publicly for all the different projects?

MS. HOOVER: Yes. A summary. You know, so individual results go back to the participants, and then summarized versions of the results for each project will be available. Does that answer your question on the website?

PANEL MEMBER WILSON: Yes, it does. I guess the question is the -- if it will be -- if it's overly summarized, it makes it difficult to use. But if it's -- obviously, you can't granulate it down to individual levels. But my sense is sort of to Julia's point, that this is -- you know, it's unique information that we're generating here. And it will be used -- I think people will -- I'm just looking at, you know, any number of these that the public will be able to take this information and

put it to use in various ways.

And so as much -- I just am encouraging the Program to make as much information public as we possibly can, you know, and to avoid making it, you know, too aggregated, but to lean toward, you know, further granulation of information. And as much as we can make public as possible.

MS. HOOVER: I guess I'm going to say one comment, and then maybe if anybody from DPH wants to follow on. But it's a good point. And, for example, our original data summary report, we aggregated all the projects to report to detection frequency.

So now, we're actually going to -- we're now going to the next step, where we're actually pulling out individual projects. So this will not be overall aggregated, because you can wash out, you know, things -- differences you see among different populations. So this will be back to individual projects.

Ultimately, down the line, you know, there may again be a larger aggregation to look at -- you know, depending on how much data we collect, and if it's valid to do some aggregation later down the line when we have more results.

PANEL MEMBER WILSON: Okay.

Just so you know, we really -- closer.

MS. HOOVER: Identify yourself.

DR. FENSTER: Oh, my name is Laura Fenster. And I'm an epidemiologist with the Biomonitoring California Program.

Sorry.

We spent a lot of time taking the Panel's recommendations very seriously when this group of us met, both -- a lot of members of EHIB, and Sara representing OEHHA. And one thing that we did talk about was if there was something in particular we noticed that seemed higher in the California population, versus the NHANES population, we wanted to take the time to find the most appropriate NHANES population, put link to that. I mean, this is for future development, but put a link to that and draw that out.

So really carrying forward the mandate of this data being useful to, you know, a broader section of Californians, rather than our participants. And then, of course, there's been, as you know, so much time put into fact sheets about how to minimize or decrease exposure. We would also link to those chemicals in the hopes that it would be both educational and decrease exposures, to the extent we can.

PANEL MEMBER BRADMAN: I just want to follow-up a little bit too. I wanted to clarify, Mike, what you're

suggesting, because if you go to the NHANES database, they actually, you know, have publicly available data down to the individual. Of course, it's anonymized, but for many -- for much of the data that's available, at least on a national basis, you can get individual level data. Of course, it's all anonymous.

And I was wondering is that the kind of approach you were suggesting, or were you thinking by study or by, you know, maybe additional subcategories like gender or age or that sort of thing?

PANEL MEMBER WILSON: Yeah. I guess I have a question first, which is that when you mentioned aggregation, Sara, were you talking about aggregating across the different projects or within projects themselves? And then I'd like to respond to Asa's point.

MS. HOOVER: So basically, I'm going to stand here so Laura can add on. What I'm talking about is, you know, originally we couldn't pull out the individual projects, because we couldn't release that level of information, so we aggregated it to report detection frequency. Now, we're backing off and showing each individual project.

I'm thinking about like longer down the line, if we had some logical way -- a valid way to go across studies again, then we might present, you know, aggregated

data again, based on some, you know, statistically valid approach.

DR. FENSTER: I don't really have anything to add, other than I think we'll just be closely looking at the data to see any trends or ways to look at it that would be informative to protect public health or to raise issues, in terms of future activities for the Program that you might also have. I mean, we'll be sharing it with you and you'll also have the opportunity to look it and maybe come to some recommendations.

PANEL MEMBER WILSON: I guess -- so if I could respond the Asa's question. It seems to me that it would be -- you know, it's useful to have some interpretation and aggregation of information of findings within each project. So, you know, your FOX study, here's what we found, among California firefighters, and aggregate that data, make it -- but it's also very useful to have, I think, you know this -- the individual level findings that could be used by researchers and others to advance, you know, and sort of amplify your findings in the literature and in additional studies, and to augment studies that other are doing.

DR. WATSON: I want to answer -- give a response to that.

I'm Berna Watson, from Biomonitoring California

Program. Well, from the beginning, when we are managing thinking about managing the data, in terms of data availability. Well, in addition to data being presented as an aggregate data, individual data first needs to be presented to the individual participants, and that will be shared with our collaborators.

And after there is a certain period of time that we have decided. And after that, the data will be available also to people who request from the Department of Public Health, from the Biomonitoring California Program. So it will be researchers when they request that this can be available. But first, it will be available to our collaborators to, you know, helping us in the field to do these projects in MIEEP or FOX.

PANEL MEMBER WILSON: Okay.

DR. LIPSETT: Could I just respond as well?

Michael Lipsett, Department of Public Health. And that's a very interesting suggestion, Mike and Asa. And it's something that we actually have not really thoroughly discussed as a Program, so it's something we will talk about in the future.

We may have -- you know, these data sets are different though, as you know, from NHANES. NHANES is population based, probability sample nationally. You know, thousands of people a year who are analyzed. And

these are very small study population. So there may be some confidentiality issues even, you know, providing individual level anonymized type of data. We may be able to do this and we'll talk about it. And this will be something that we could talk about in greater depth, you know, once we, as a Program, have had a chance to reflect on it. But it's really interesting and thank you for the suggestion.

PANEL MEMBER WILSON: Very helpful. Thank you.

CHAIRPERSON LUDERER: All right. Any additional comments?

Asa Bradman.

PANEL MEMBER BRADMAN: I have a comment that's not related to this template, so if there's more discussion related to Michael's presentation, when you're ready, we can move onto that.

CHAIRPERSON LUDERER: Well, we are behind, so we don't --

PANEL MEMBER QUINT: Okay. I won't ask then.

CHAIRPERSON LUDERER: But Asa Bradman, did you have a comment?

PANEL MEMBER BRADMAN: Sorry. This was not a clarification to Dr. DiBartolomeis' presentation rather, I think your second bullet raises a lot of discussion issues that we have to consider in the future.

There has been a fair amount of discussion within the Panel. And there was actually a strong sentiment, in previous discussions, that we should separate any sort of risk -- assessment of risk evaluation from the Biomonitoring Program to avoid the program getting bogged down in, you know, issues of judgment and conflict over, you know, cut points and things like that.

So I think there's some rich opportunities for more discussion there, and maybe that's not appropriate for today, but there's some history here that we might want to revisit and budget time for in the future.

CHAIRPERSON LUDERER: Dr. Solomon had a comment.

DR. SOLOMON: Well, I just -- I know we're running behind. Gina Solomon, Cal/EPA. But I did have a question for the Panel about the results template table, because it's something that I've wrestled with about how to talk about biomonitoring data, which is, as you all know, the results are almost extremely skewed. And so even reporting out the 95th percentile is actually reporting out, you know, nowhere near the highest value.

And so is there any benefit to -- you know, to thinking about is there someway to address that perhaps, or -- I mean 95th percentile is sort of where you get, you know, with sort of, you know, some statistical confidence. And so, you know -- but, you know, perhaps, you know, for

a large enough sample size, you could start looking at 98th percentile or others. And I'd be interested in what the Panel thinks about that.

CHAIRPERSON LUDERER: Dr. McKone.

PANEL MEMBER McKONE: Well, this goes to the -- I was actually going to raise this point, and then thought it was kind of picking at details. But where it says geometric mean and 95 percent confidence interval. First of all, I probably wouldn't call it a confidence interval, even though statistically it is. It tells -- what does it mean that we're confident -- I mean, when you're putting us out to the public?

It's really the range, and what it is is it's a range from 2.5 to 97.5, right. So you actually have almost a 98th percentile in that range. And it might be in like the mean in a range there and then the percentiles.

I don't know if -- I mean, I think you have to ask the question about -- well, I mean, the other question I'm assuming when you say the 95th percent confidence interval, you're not talking about the 95th percent confidence interval about the geometric mean. Sometimes people report that.

(Yeses.)

PANEL MEMBER McKONE: Oh, you are. Oh. All

right. Well, why couldn't you just do another one with not the percentiles but the full range across -- oh, okay. So that's the confusing point, I guess, is whether --

MS. HOOVER: Yes. Let me just pipe in.

PANEL MEMBER McKONE: That's a 95 percent variance, so it is --

MS. HOOVER: Okay. So Laura can answer that. Before I hand the mic to her, just to be clear, this is not set in stone. This is a sample template. Sometimes there will be less. Sometimes there could be more. If we had the robustness to go out to 99th, we could add that. So this is not like that, you know, the be all and end all of what each thing is going to look like. And some might not have the 95th. Some we can't necessarily calculate the geometric mean.

So, Laura, you want to just say something about that.

DR. FENSTER: I don't want to take up too much more time with this, because we have discussed it. But I think we wanted to develop a template that could be used, so that the data could be compared to other studies, to NHANES, something that we could say that we would -- we went through the different descriptive characteristics and that these we could agree on.

I looked up papers for CHAMACOS that we worked

on, and these were all common elements. NHANES are very common elements. But if you have specific suggestions. And, again, I like what Sara said. It's not the be all end all, it's just basic components that we could present on the web for, you know, all of the work that we've done. If something isn't captured in this, of course, we would try to, you know, address that in the table.

MS. JOE: This is Lauren Joe, CDPH. And one, you mentioned presenting a range, you know, the minimum to the maximum. And one reason why we thought maybe not to include that is for the minimum and max, it would identify one individual. And some of the studies are really small, so we want to keep it to just the general range.

But it's a good point about the 99th percentile. And I think for some of the larger studies we may be able to include that.

Thanks.

PANEL MEMBER McKONE: Just a follow up. I certainly agree. One of the problems you're going to have, is you can't really do the -- the minimum is going to be the limit of detection for most of these studies, so you really -- it's a little deceptive to say, oh, this is the minimum. It's the minimum, because it's set there.

I agree, don't -- anyway, the highest value could sometimes be so far out. And it's like -- but the 99th

percentile is probably a good thing, if you want to show the highest likely N.

CHAIRPERSON LUDERER: All right. I know we're having a very lively discussion here, but we do need to move on.

MS. HOOVER: And just to let you know -- sorry. I'm just offering. There's lots -- I'm the one cutting it off, so I'm just going to offer, if you have thoughts on this, please email us. You can definitely give us input by email. That's it.

CHAIRPERSON LUDERER: All right. Thank you.

So our next presentation is going to be by Dr. Myrto Petreas, who is Chief of the Environmental Chemistry Branch in the Environmental Chemistry Laboratory at DTSC.

And Dr. Jianwen She, who is Chief of the Biochemistry Section of the Environmental Health Laboratory Branch at CDPH.

And Dr. Petreas and Dr. She will provide laboratory updates and present recent Biomonitoring California results.

(Thereupon an overhead presentation was presented as follows.)

CHAIRPERSON LUDERER: Dr. Petreas.

DR. PETREAS: Good afternoon, everyone.

I'll look this way. Okay. So I'll try to be

pretty quickly here. So I'll give you an update of the status where we stand. And you may have noticed I'm recycling these, so it's the same formatting.

So I'll talk a little about our staffing and resources, our quality assurance programs. Then progress on where we are with the different field studies, and finally, some preliminary results and future activities.

So no changes in staffing. We still have our two originally funded staff, plus the four staff funded by the cooperative agreement from CDC. And we're very grateful for that.

But, of course, the work we do could not have been accomplished without the in-kind support of all these other DTSC funded positions, so including supervision and another activities. It's a happy bunch and we're a good team together.

(Laughter.)

DR. PETREAS: So quality control. It's in session for the Program. We participate in every formal proficiency testing. The PFCs is the only class that CDC provides us with the proficiency material. And we've done it twice already with them, and we got a perfect score. We also participate in the Arctic Monitoring Assessment Programme for persistent organic pollutants. And we've done it already once in 2012 and we passed again a hundred

percent.

And as the slide shows here, we were doing it in 2003 -- 2013. It was underway last week, but we got the results, and it's again hundred percent. So we're doing pretty well in everything we participated. And in addition to this formal PT programs, we collaborate with scientists from UCSF all the way out to Korea and Sweden. So for many different new methods, we rely on collaborating with other programs.

Of course, we use certified materials when they're available. And I guess we have a very good quality management program, but you wouldn't expect anything else from us.

(Laughter.)

DR. PETREAS: The steps -- I'm using a different form to record the status of where we are on the different -- the three major studies, MIEEP, FOX, and BEST. So we had completed all the persistent organic pollutants on MIEEP sometime ago. And the results have already been sent. The same thing with FOX. And we have completed the PFCs and the PBDEs of the BEST. We're still working on the PCBs and OCPs from them.

The hydroxy-BDEs, I want to make a correction to Dr. DiBartolomeis presentation, we didn't have any technical difficulties. We had another method, but we

didn't like it, because it was using diazomethane, which is a very hard to use chemical to derivatize. So rather than GC-MS, we waited and spent some time to develop a method for LC-MS, and now we have it. And, in fact, it's a new LC-MS method for hydroxy-BDEs. It was presented just a few days ago at the BFR meeting. And we already started, and we have analyzed 50 of the 140 samples. So we should have results pretty soon on it. And this will complete the MIEEP study.

And BEST is coming along.

Last meeting, I gave a little presentation about the California Teachers Study. Just to reiterate, it's a -- this is a long -- this is a longitudinal cohort that was established back in the nineties. Women have been followed for so many decades. And so in collaboration with the Cancer Prevention Institute of California, Dr. Peggy Reynolds is the PI, UC Irvine, University of Southern California and City of Hope our lab was funded by the California Breast Cancer Research Program to look at the certain hypothesis of breast cancer and the exposure to persistent organic pollutants.

So blood samples are collected from about a thousand cases and a thousand controls from the entire State. We started recruiting in 2011. It will be completed by 2013. And the samples will be analyzed for

PCBs, PBDEs, PFCs and will be sending to clinical labs for thyroid, hormones, and lipids.

So progress. Everything is yellow. Nothing is green. Even though, it looks green there, it's yellow on my screen. So we're still in progress. We have received about 1,700 samples. They keep coming in batches. And we have different processes. So PFCs are on their own, so we start from scratch on the PFCs.

And just to follow that column, we have extracted 157 samples, as we speak, as of April 1st. That was when we stopped. And the first batches have been already completed, and the data have been released to the person -- to the principal investigator, so we show results from 614 women already. For PCBs, OCPs, and PBDEs are analyzed in a different procedure.

And, so far, we have completed and released to the PI 323 results from PBDEs. PCBs and OCPs are coming along.

So just to describe, for those 614 women for whom we have results for PFCs, these are the demographics that we can report here, in terms of race and age. I should mention this is a quite old cohort. I think the median is in the sixties, if you look at -- oh, sorry. Go back.

So it's an older population. It's primarily non-Hispanic white. But one of the aims of the study is

to look at discrepancies and the disparities among different racial groups. So this is a population, and these are the results where the 614 women. Now, this is trying to use a template that we're discussing, so it's an excerpt of this template.

And you can take a look at how it would look. We list the perfluorochemicals on the first column, so the chemical name is there. Geometric mean and the 95th confidence interval of the geometric mean are shown in the second column. And then the percentiles of our population are shown in the right part of the table.

Whenever, we had fewer than 65 percent detects, we did not calculate the percentile or a geometric mean. And LOD means lower than limit of detection.

So this is how results will look. So this is a subset of our population, as of April 1st of 614 women. Using the same template, we'll be showing here the comparison to the NHANES. So the right hand -- the left part remained the same. The right-hand columns changed, and now instead of our distribution, it shows the NHANES geometric mean.

In here, we selected the women 40 years and above from the NHANES. So this limits to only 674 women from NHANES, very similar to our overall number. But please note that NHANES, the latest data available from 2009-10,

whereas ours is about three years later. We didn't want to go, at this point, and make any comparisons, and vague comparisons between the populations. We want to have a few more numbers there and digest. And we're working on manuscripts so we can describe there on what we see and what the limitations of these comparisons may be. It's not only the time period of collection, it's the age. So there are different things like that.

So continuing with the PFCs, the table will also show the detection frequency. Again, the same chemicals are listed in the first column. Detection frequency was from a hundred percent down to 13 or 14 percent. And we are also showing the limit of detection. So that's for the PFCs.

Then we also released PBDEs -- released to our PIs, to our collaborators. And these are the data we are proposing to post on the website as soon as we can. So the age and race distribution for the 323 women for whom we have PBDE results, they're not -- some -- there's overlap, but not completely overlap here. It's shown here. Again, it's an older cohort -- older population. Median is round 60 something.

And the results now for the PBDEs are shown here. We measured many more congeners, but we only report the ones that we can compare with the NHANES the future and

also are measurable.

So again, the same idea, the name of the chemical is in the first column. Geometric mean and confidence interval, followed by selected percentiles. And again, we changed to show the NHANES data, again for women over 40 years and above. And this is a comparison here. Again, here the difference is even more drastic, because the latest NHANES was 2003-4, whereas ours is 2011 and '12.

So this will be the template that will be used. I need to pause here and say that we do see a drop in this data, even though they're different time periods. And we have report -- I can say that, because it was reported in the BFR meeting. We had two posters, one with the Dr. Reynolds and her group, and one with Dr. Zota from UCSF and her group.

And in the first poster, it was this exact same PBDE data from the Teachers Study. And we compared those to the same NHANES, and we compared those to a previous study we had conducted with Dr. Reynolds back in the late nineties on breast cancer from Stanford and Kaiser populations. It was adipose tissues, in that case, whereas it's blood here. So there are a few caveats and different demographics, but we see statistically significant drops in BDE-47 and 100, not in BDE-153. And there are some explanations for that in terms of

half-lives.

More drastically is the difference we see with Dr. Zota's study on -- these are pregnant women. We have published the first results collected in 2008-2010. And the newer data from the same population from San Francisco General Hospital, same demographics show again a very significant drop in the distribution -- in the concentration of PBDEs, even in such a short period of time.

So I think we can show that biomonitoring does work and shows differences, because when PBDEs were restricted or banned, at least we can see now we can see the effect, because we can see it in our bodies.

Of course, we heard them this morning the other chemicals that are being used instead of PBDEs and soon we should be able to have measurements of those, but unfortunately they should be going up, but we don't know.

So that was about the PBDEs. And again, going back to the table, we'll be showing the same format of detection frequency, and limit of detection, and here we have to explain that the limit of detection in the lab is determined on, what we call, wet weight. So you analyze something in the liquid blood.

But to compare with others, the persistent lipophilic compounds, we need to adjust for the lipid

content. And because lipids vary between individuals, usually we have different ranges, including the detection limit. So we propose to be showing both the wet weight detection limit and the lipid weight for those who are chemists and want to know exactly the lipid adjusted measurements. Okay. I think that's thus far of the -- the results so far.

Now, we talked about sustainability of the program and how can -- where can we find more samples. So the Genetic Disease Screening Program is great resource that's a statewide archive of prenatal serum samples. The question is can we use it for Biomonitoring California?

And the questions to me and my lab was more technical, in essence, of -- so the questions we've had is do we have enough volume to analyze the chemicals we want?

And how were samples collected? I mean, what kind of tube. Will there be any problem with the tube? Do we know how these tubes behave? And could there be chemical contamination? Could we trust the results that have been archived and processed in different ways, not having in mind that this will be used for trace analysis of certain chemicals?

The purpose of this is to look at proteins basically for genetic diseases. So we're in discussions with the Genetic Disease Laboratory in Richmond. And our

staff visited the lab, after discussion, to observe and discuss what exactly happens.

So what we found out that the GDL, Genetic Disease Lab, the serum samples are placed in some trays and they stay uncovered for many hours, which, in our case, is a no, no, because we don't want to have anything exposed, but we have to observe how it was done.

They go sequentially through three different machines or plungers that go, insert it into the tube, aspirate some volume, test it, and then proceed again to the next machine. And if something goes wrong, we have to repeat it. So it could be many hours that the samples are out, and can be sampled more than once.

So the observation wasn't very reassuring. So what we decided to do was to do some testing. So we provided them -- we got the tubes from them, the same tubes that -- there are serum separator tubes that we hadn't tested before, and we tested them with our bovine serum, and there was no such contamination, so we felt it was okay.

Then we filled three tubes with our bovine serum and sent them to them, so they can process them as if they were the regular samples, and then got them back to analyze. And along with ours we got back some real samples that they had processed and we analyzed them. So

we had 20 samples from real, you know, prenatal screening, and three bovine serum and they're in the same tubes.

What we saw -- we only have analyzed so far the PFCs, and we found the consistent background or PFOS, one of the most prominent PFCs in the lab blanks. However, this background is not significant, because the measure -- the levels that we find in every sample is much higher than that. So this will not impact our ability to use the PFOS data.

But we couldn't understand where the contamination came, was it the collection tube, was it the chemical lab -- the clinical lab background? It wasn't from our lab, because we had the other controls in the system. The other PFC compounds had no background level, so that's encouraging.

So we didn't -- when we analyzed the real sample from two clinical labs that the GDL provided us, we didn't see anything unusual. So the distribution fit, you know, whatever we would expect. So it's encouraging.

But the concern for us is not so much the PFCs, it's the PBDEs. And we don't have data yet. So by the time next meeting we should have data, and -- now, I guess this testing can only tell us if we cannot use a sample so we find the problem, we know we cannot use them. But not finding problem doesn't mean that there won't be some

problem that we haven't -- just the few samples that we're testing just didn't reveal.

Okay. So future activity. So we want to complete the analysis for the remaining chemical classes and hopeful report to you in July.

Now, I want to talk to you a little bit about some other collaborations, and some new instrumentation to identify unknown chemicals that people are interested in. So, first of all, in collaborations, the Child Health and Development Studies. Dr. Barbara Cohn is the PI. And I have been working with her for over 15 years analyzing samples for many different studies.

So what this is, it's a fabulous resource. This started about 50 years ago, where Kaiser Permanente members, pregnant women -- about 15,000 pregnant women in the Kaiser system participated in the study. And this comprised about 90 percent of all pregnant women who received obstetric care at Kaiser between '59 and 1967.

So there's archive data from medical records, a baseline interview from all the participants that included demographics, pregnancy and a reproductive history, and the smoking, alcohol consumption, and such. And there's archived serum, either from before birth, first, second, and third trimesters or postpartum.

(Laughter.)

DR. PETREAS: Okay. So it's a fabulous resource. And again, our lab has collaborated and have generated a little over 2,000 measurements of PCBs and pesticides in the maternal sera. So these are all women from the sixties. So not much interest for a Biomonitoring Program, but a lot of information and a lot of interesting work.

The interesting thing now is that there are new studies in progress, and we have been funded by the California Breast Cancer Research Program to do what's called the Three Generations Breast Cancer Study, or 3Gs. So the idea here is we have the mothers in the sixties -- who gave birth in the sixties. And now that some of the daughters have reached the age, and they developed breast cancer.

So the studies of the daughters and controls of these women whose maternal sera we have characterized and whose information we have. So this 3Gs study expands the original CHDS study, because we are adding the second generation of adult daughters. And the plan is to get even the third generation of daughters in the future.

So these second generation daughters is contemporary women. So it's really -- it's from California. The specific questions that we are going to look is does the daughters exposure in utero to the

environmental chemicals that her mother's blood contained, does that increase her probability for breast cancer? So this is to look at maternal serum. So we'll be doing that.

But what's of interest for this Program is that we'll be looking at the daughter's serum, which is collected 2012 and '13, and looking at if whether these environmental chemicals and metabolites in the daughter's blood, do the differ by race, income, and other subquestions and subhypotheses. And also how do levels between mothers and daughters compare? Could you predict the mother's outcome by -- the daughter's outcome by the mother's blood?

So we think that the 3Gs study can really benefit by Biomonitoring California, and Dr. Cohn has agreed to share the data with us. So we'll be analyzing 300 of the daughters for pesticides PCBs, PFCs, PBDEs, and hydroxy-BDEs. And the results will be incorporated in the Biomonitoring California database.

So the same thing we did with Dr. Reynolds we'll be doing with Dr. Cohn's data. And, to me, it's ideal for program sustainability, because we're getting the samples without much effort from the Program, and we get funded to do the analysis. So it's a big synergy. So that's something for our future collaborations.

Okay. Finally, instrumentation for identifying unknowns. We are very excited, because the CDC has agreed to allow us to request to buy in our fifth year of the cooperative agreement, and some instrumentation that would allow us to look at unknowns.

One of the requirements that CDC had originally, when we first proposed that five years ago, it was too researchy. So they didn't like to do research. And now they would like us to have something that can give us both qualitative and quantitative capabilities.

And fortunately, the technology has improved, prices have dropped, and we're discussing with CDC experts. They don't have a TOF -- or, I'm sorry. I call it TOF, but it's a -- let's say it's an instrument that allows us to identify unknowns. It can be a Time of Flight or other technology.

So we have been in discussion through our project manager, Lovisa, with her experts that do TOF, mostly for the bioterrorism programs or other programs. We are in contact with the different vendors and our staff get information from users and vendors. And we're going to have a discussion where Lovisa visits us this month, and try to finalize what we want to do. But it is very hopeful and very promising, because this would allow us to go beyond the knowns.

So two minutes.

(Laughter.)

CHAIRPERSON LUDERER: Thank you, Dr. Petreas. I'm sure everyone on the Panel will agree with me that that's very exciting to hear that last slide about the identifying unknowns. It was, I think, in 2011 that Roy Gerona came and talked to us about techniques for doing that. And that's something that the Panel has been very supportive of for quite awhile. So thank you.

CHAIRPERSON LUDERER: We'll have -- should we go on to the second presentation and hear from Dr. She and then ask questions about both lab updates at the same time.

All right. So Dr. She.

(Thereupon an overhead presentation was presented as follows.)

DR. SHE: Good afternoon, and welcome, members of the SGP and audience. Today, I will provide an EHL update and some preliminary results for some phthalate and hydroxy-PAH data for the FOX study.

I'm going to update you on our methods in production, project sample analysis status, recent study results, and new method we brought into the production, and finally, our future work.

At the last meeting, we reported we have nine

methods in production. Since then, we brought the last analyte group we promised the CDC we needed to do. So far we completed all of the method development effort and specified our grant application.

So, to date -- and to date EHL have the capacity -- the capability to measure over ten groups of -- ten classes of chemicals with 68 analytes in urine. Again, I'd like to thank my team. They're able to bring this up within a shorter time from -- before the Biomonitoring Program, laboratory only measured one analyte, which is lead. So today, we can measure 68 analytes.

As specified, our new method in production is perchlorate in urine. This slide shows you the different level of quality controls. So this is three quality control charts. We can use a low quality control, medium, and a high. And it's important that we look at the left corner side of the small tables. You can see within the 24 repeated runs, we can reach very low relative standard deviation. So that's -- most of the time that's below 10 percent. Our method is very precise.

Also, if you remember in our -- in my last presentation, we used NIST standard reference materials. We have very high recovery and prove our method is very accurate.

By the way, this method can reach 25 ppt levels. So it's a very important method, because some study found in California perchlorate maybe -- you know, the population may be higher than the general population.

We have 12 samples, which are measured by CDC, also measured by our lab. So from this slide we did a correlation analysis. You can see comparing our results with the CDC results, our slope is almost close to one. Intercept is very small, not significantly different from zero. Our coefficient of R^2 is very good. So this slide demonstrated our method performance is equivalent to CDC's method performance.

Next few slides I will talk a little bit about our analytical status. You hear Dr. Mike D's presentation, so that more details like -- we finish the MIEEP study. On the secondary columns, you can see we did 136 metals in blood, and there are about 89 different class of chemicals in urine.

And second bottom column, we analyzed also 13 participating samples for the arsenic -- speciated arsenic.

Also, for the FOX samples, except arsenic speciation work still under review, all of the other analytes we already reported to EHIB for the result return.

And the last column shows our progress on the BEST samples. We finished all of the metals in blood and 60 samples for perchlorate analysis were finished. And in between this analyte, we needed to finish in like the next few months.

In next few slides, I try to show a little bit of the arsenic speciation result and the progress. So this slide, the first column shows which speciated arsenic we are looking. And this result has come from the MIEEP projected of the -- I mentioned only six analytes was for -- the 13 samples was analyzed for speciated arsenic, so that detection frequency don't mean so much. It comes from very small sample size.

As you may remember, we also analyzed total arsenic with different method. So we compare our speciated method result and the total arsenic result from different analytical procedures. So from this slide, you can see our speciated result correlated very well with the total arsenic. That means we didn't miss any major species.

Within the six species we monitored, we found two of them are the dominant ones, which is DMA, dimethyl arsenic and arsenobetaine. So because they also -- there's two species the sum of them correlated with the total very well. So the other species, like arsenic III,

V, that present but are not like the other major species.

And the next two slides -- few slides, I will talk a little bit about the California firefighter studies, compared with NHANES general populations.

This first slide is the phthalate result comparison. Our laboratory measured a total of six analytes, including MCHP. And in this table, I didn't list them, because most of the time they are below detection limits. So the five of them above -- most time above the detection limit, you can see our detection frequency listed on the last and second columns is above 80 percent.

Compare with the NHANES detection frequencies, we are a little bit lower on the MEP, because this -- for this analyte our method is slightly inferior on the detection limits. We have 80 ppb. So that may cause the detection frequency to lower a little bit. But for all the other ones, it's comparable.

If you look for geometric mean at 95th percent confidence intervals, it's overall -- the phthalate level in the firefighter is lower than the general population. But we need to remember is firefighters sampling is not done after that firefighter activities. It is like off-duty sampling.

And phthalate, most of the time we use for the

firefighters gloves, hood, and showed not affected so much by the firefighter activity. That's my personal reading. But even with this, it's still low.

This is a graphic we present -- graphic show of the same information I show you in the previous tables. You can see that started with the highest levels of ones we found, which is MEP is a metabolite of diethyl phthalate. We found low levels compared with the general population. The general population that means the NHANES measured over age of 20, from 2007-2008 results.

So also the MCEPP, the level is low too. MCEPP is the second highest analyte we found. MCEPP, by the way, is a metabolite of DEHP, the secondary metabolite by DEHP.

For the other ones, you can see MBP, MCPP. Both of the metabolites have DBP, but MCPP can have two parents. One is DBP, one is dioctyl phthalate. So we will do further analysis, for example, try to associate the MBP and MCPP to see how they are correlated. So this is very initial detail we try to show. The bigger picture I wanted to say is the levels are low.

This is some initial comparison of hydroxy-PAH from Southern California firefighters. And then NHANES, I considered general population data. So overall, again, the level is low, but as I mentioned, PAH may be released

during a firefighter event. So this simply was not collected maybe immediately after the firefighter event. It's like a few days. So this result maybe not typical to represent a real firefighter studies. For example, New York -- like after World Trade Center, CDC conducted firefighter studies, and they find a different result. So this maybe not typical to say the firefighter did not expose to the PAH. Maybe only due to our sampling time didn't catch it.

This is a graphic representation of the same information I showed before. I need to point out for 1-hydroxynaphthalene, and 2-hydroxynaphthalene is scaled down time by 10. As I mentioned before, the Southern California firefighters had a lower concentration for all hydroxy-PAH in this study.

Now, I want to talk about your new chemicals. For example, this modeling -- in Dr. Linda Birnbaum's study she talked about the BPS. And currently, our laboratory measures the BPA, as you know. CDC found BPA levels around one ppb.

But some recent studies, especially from New York Biomonitoring Program, that found a few other chemicals BPS, especially BADGE and the first chemicals I showed on the pictures. The levels -- they collect 127 samples -- urine samples, which is half maybe from America, half from

China. They found the BADGE level in Chinese samples is three times lower than American samples. It's similar to the PBDE we found. America PBDE is much higher than other countries. This interested us, the information.

And compare with the BPA, BADGE is substitute, but BADGE's level in that study reported by Dr. Liao is three times higher than the BPA's level. This is scary substitute. The level is higher than the chemical they're trying to substitute.

So the laboratory right now working on all of these few chemicals, and include maybe more in the future. The challenging part, as I mentioned are the levels. Even the BADGE is three times higher than BPA is about three ppb. So that's a required method of very low detection limit.

New York program reported 20 ppb -- 20 ppt detection -- so we're still working on that to reach that level. So that may take us a few more months. I hope by next SGP meeting we will have some more positive results to report.

So this is my last slide. And as I mentioned, in the next three months we'll try to finish this BPA method, and complete FOX data review. That's only one analyte group, arsenic speciation, and analyze Pilot BEST samples, and analyze some further laboratory collaboration samples.

By the way, we have a collaboration with University of Irvine. Dr. Ulrike, we finish all of the sample analysis. We just need to return the results to you.

And develop -- further develop and validate our automated sample process procedure to increase our throughput.

Thank you.

(Applause.)

CHAIRPERSON LUDERER: Thank you, Dr. She for that presentation. It's always great to see all the progress that the laboratory has made between one SGP meeting and the next.

We have time now from the some clarifying questions for either Dr. She or Dr. Petreas from the Panel members?

Are there any clarifying questions, comments?

Dr. Bradman.

PANEL MEMBER BRADMAN: It's kind of a boring comment. But I just had a question for Myrto. If you had checked for evaporation in the samples, you said that the genetic disease lab have the vials out for a long time uncovered, and if the volumes were low, is there a potential for evaporation?

DR. PETREAS: We didn't check that. Drying out,

you mean?

PANEL MEMBER BRADMAN: Yeah, exactly.

DR. PETREAS: I mean that would have been assessed by probably the lipids or the -- no.

PANEL MEMBER BRADMAN: Okay. I just wondered --

DR. PETREAS: But it wouldn't change the POPs. It wouldn't change the chemicals there.

PANEL MEMBER BRADMAN: Well, on the wet basis, like the lipid basis, you know, I think the lipids would evaporate, but in the wet basis, it might change the --

DR. PETREAS: Okay. So you have a point, because we did the PFCs, and the PFCs we report on a wet basis. Levels of the 20 real samples looked like you would expect within the range that we've seen from others. No, we didn't check that, so it's a point --

PANEL MEMBER BRADMAN: It might be something to look at.

DR. PETREAS: I don't even know how to look for it. What do I look for?

PANEL MEMBER BRADMAN: If you have like a standard reference material or something that -- with a known amount that then went through their system, you could see if got concentrated somehow.

DR. PETREAS: But each of their samples goes different number of times through their system, stays

different hours outside. What we got is from GDL in Richmond, I guess the reference laboratory, the real samples are getting done in throughout the State in different labs and they are shipped there.

PANEL MEMBER BRADMAN: Oh, I see. Okay.

DR. PETREAS: So that's why I'm saying, if we find the problem, we know there is a problem. But if we don't find the problem, it doesn't mean there isn't a problem.

PANEL MEMBER BRADMAN: Right. Got it.

(Laughter.)

PANEL MEMBER BRADMAN: And then one last comment. I think you mentioned that the plan was to report the results on both a wet basis and a lipid-adjusted. And I think that's a great idea.

DR. PETREAS: The detection limits.

PANEL MEMBER BRADMAN: Right. But if I understood correctly, you were going to report on the -- in terms of the general reporting that it was going to be on a wet basis and a lipid-adjusted basis.

DR. PETREAS: That not what I think, but we're open to that. I mean, this is not -- we have the data in both ways anyway.

PANEL MEMBER BRADMAN: I think it's useful both to consider both on a wet basis and a lipid-adjusted

basis. I know -- at least in the literature, there's a lot of discussion going on right now, similar to debates around, for example, creatinine adjustment, where lipid adjustment is always the best way, even for some of these lipid soluble compounds, because they also have some aqueous solubility. And also right now, at least in many cases, the method used to compute total lipids is still an approximation, which may or may not be the best approximation.

DR. PETREAS: Yeah. We're using total cholesterol and triglycerides and the Philips algorithm to do it. But we have the data of triglycerides and cholesterol and we could -- I mean this is up to the Program what they want to -- we have the data. Whether we want to present or not is something to discuss.

PANEL MEMBER BRADMAN: Right.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: Yeah. My question is for Dr. She with regard to the PAH findings for Southern California firefighters and NHANES. And these are -- the PAHs are water-soluble, so they have a fairly short half-life in the body, is that right?

DR. SHE: Yes.

PANEL MEMBER WILSON: And so I'm just curious what -- you know, if these -- if these findings -- what

this -- if you could just interpret these a little more, that what you were saying was that these are sort of baseline levels for firefighters, because it's -- it didn't -- the samples weren't taken obviously after there had been so high exposure period. But is this also saying then that there's basically ongoing sort of baseline exposure to PAH's nationally as demonstrated by the NHANES data on a continuing basis, because of the short half-life?

DR. SHE: I will try, and correct me if I'm off the question. So PAH exposure can be multiple source, for example, smoking. To correct the smoking contributions, the laboratory may need to measure the cotinine, which we cannot do that.

The second thing is like you're aware this sample was collected during the -- Sandy can correct me -- is off duty, maybe around the one week. We still need to find out more exactly which firefighters are more closer to the firefighting event. So this result here doesn't represent the real firefighter -- typical firefighters.

So the one relevant study that New York published, so even -- all of the firefighters, your first response team, I use the centers that study, they have the -- after 911, they collect the sample in the third week for the firefighter, but the fire lasted longer, as

still -- fire still -- firefighter activity still continue, so that's through the -- that appears the time they collect the samples. For the special responder commander teams, their levels are higher than the people who not go to respond to that event.

But overall, somehow the firefighter's PAH level, if I read the paper correctly, still lower than the general population, according to CDC's study. But I don't know why, because we think this is -- so it depended what kind of fire you fight. So that if wildfire or construction fire, they can expose different, temperature of the fire can PAH be formed. So that may be not typical for a specific event.

Also, I think we need to conduct more study, so each fire event can be very different.

PANEL MEMBER WILSON: If I could just follow up. Just one more. Would one of the other sources of PAH exposure be diesel exhaust?

DR. SHE: (Nods head.)

PANEL MEMBER WILSON: I mean, that would -- I would think that would probably be the more continuous exposure problem in the fire services.

DR. SHE: Yes, right. Yeah, that and smoking, diet, like barbecues is kind of another event. I'm not sure whether it's continuous, but that's like you're aware

this is very short life times and continuous ones may be provided back on. The other event, like barbecue, may provide peak times, but not the continuous basis.

DR. McNEEL: If I could do a follow up there as well. Sandy McNeel with the California Department of Public Health.

And, yes, Dr. She brings up a good point that when these firefighters were enrolled into our project and provided their biosamples of -- they were a convenience sample that we got during their annual physical exam and fitness testing. And most of these firefighters were coming back on to duty after having been off duty for anywhere from, maybe a day or two, to a couple of days to a week.

And we'll be able to look at that a little bit more specifically when -- you know, when we look at some of the other confounding issues and have an opportunity to look at some of the other contributing factors. So we may be able to provide some more information on some of the factors that do seem to relate, or may contribute in addition to, you know, the low levels of the PAHs in these firefighters.

Thank you.

CHAIRPERSON LUDERER: Yeah. Ulrike Luderer. Certainly for the population, food is probably thought to

be one of the major contributors to PAHs, like, you know, maybe a 1 to 17 micrograms per day, depending on how much people -- you know, what types of foods grilled, things people eat, and then polluted urban area as well. That's another major source of exposure. So it's definitely contributing to the firefighter's exposure as well.

All right. So we have one public comment. Did we get any additional ones or are we -- just the one. Okay. So we have one public comment, and this is from Renée Sharp from the Environmental Working Group. And then we'll have some time for additional comments from the Panel.

MS. SHARP: I realized that this section may not be the time to ask this, but I'm actually looking at this handout that says Biomonitoring California Designated Chemicals. And there's a really lovely long list of all these chemicals that is being tested.

And there's one category that doesn't actually list the subchemicals in the category. And so I was just kind of wondering -- that is antimicrobials used in food production. I was just wondering if there was any more specificity.

MS. HOOVER: I can send you the document we did on that

MS. SHARP: Perfect. Great.

CHAIRPERSON LUDERER: All right. Is there any additional comment or discussion about the last two presentations from Panel members?

Okay. All right. We will then move on to the next presentation, which is break actually.

(Laughter.)

CHAIRPERSON LUDERER: Or we could skip the break and be on time.

MS. HOOVER: No, we can't skip the break.

CHAIRPERSON LUDERER: Okay. All right. So we have a -- should we make it a 10-minute break.

MS. HOOVER: Fifteen still for our transcriber, but let's be prompt back, but Laura has one quick comment.

CHAIRPERSON LUDERER: So we will be back at 3:15.

DR. FENSTER: Just one thing I did want to say in response to Asa's suggestion about the wet weight versus the lipid-adjusted weight. One -- I mean, we really want your input. One thing we've been also trying to temper the amount of detail that gets placed on the web, just in terms of people, you know, having to look at very detailed tables. So, you know, we might want to come back to you and get -- talk with you more about that, in terms of tempering. We want to provide information, but maybe there can be, you know, just like their supplemental tables, some other place to get that, so that people don't

become overwhelmed and just, you know, go somewhere else on the web.

MS. HOOVER: Now, a break.

CHAIRPERSON LUDERER: So we will reconvene at 3:15.

(Off record: 3:01 PM)

(Thereupon a recess was taken.)

(On record: 3:17 PM)

CHAIRPERSON LUDERER: All right. I think we're to go ahead and get started again, so if everybody could take their seats, please.

I'm going to call the meeting back to order. Welcome everyone back from break, and introduce Ms. Amy Dunn, who is a Research Scientist III, and Dr. Laurel Plummer, Associate Toxicologist, both of them from OEHHA.

And they will present on the launch of the revised Biomonitoring California website, and provide a demonstration of the new features.

Amy.

(Thereupon an overhead presentation was presented as follows.)

MS. DUNN: Good afternoon. We turned the lights off, so you can see the screen, not so you can take a nap.

(Laughter.)

MS. DUNN: So as Dr. Luderer said, I'm going to

be giving you a little background on what we're doing on the revised website, and then Laurel and I will be doing a demonstration.

So I've described to you at previous meetings that we're revising the website from the current meeting based site to develop a site that will appeal to a wider audience and improve access to information.

And the new site will be using the new State template, which, for example, is actually much easier for those using hand-held devices to navigate through.

Some elements of the site that we're going to show you include new information about Biomonitoring California projects and the chemicals that are included in the Program. There's also easier ways to get to information, both the information from the old site, as well as a lot of new information that we're bringing onto the site.

There's also a basic introduction to biomonitoring that's intended for a non-technical audience. I've talked about it briefly with you before, referring to it sometimes as the interactive brochure. And I'm going to have a chance to show that to you today. The revised site also includes a lot of photographs, diagrams, and videos to make it more engaging and dynamic.

The launch is coming soon. We're not quite

there. We're working on finalizing the content and the appearance of the site and doing some testing to identify any issues.

We're doing this testing right now internally, but we'd also like to do some testing with outside people. And so if there's anyone here who would be interested in helping us to test the site, there's a pink sign-up sheet by the exit door. And we'd really love it if you would be willing to either help us, by testing the site, or connect us up with some other people who might be interested to help us to test the site.

When the site is ready, we'll make an announcement via our listserv, and also do some other outreach to try to get the word out to people about the new site. And we're going to be doing testing after we launch also to try to get feedback on the user's experience. And as came up earlier, I think with some of the specific features, like the results template, it might make sense for us to just actually test that specifically to make sure that people understand, and that it works well for people.

So now, I'd like to take a couple of minutes to acknowledge the efforts of those who have been bringing the site to life. The website development team has been working hard for a couple of years, but with great

enthusiasm for the project. And we're excited to have the chance to show the site to you today.

And first, it's my great pleasure to introduce to you, Uli Weeren. Uli, would you mind standing up. This is our web developer --

(Applause.)

MS. DUNN: -- and designer. And he's been bringing our ideas to life, so we're very grateful to Uli.

The web development team includes also myself, Sara, and Laurel, who you know, and also Duyen Kauffman. Duyen, will you let people know who you are, who don't know.

(Applause.)

MS. DUNN: And also Laurie Monserrat who is OEHHA's webmistress. And we rely on Laurie to get our information on the website. We'd be lost without her. And the team is really -- I wrote when Linda mentioned earlier transdisciplinary team, and we all bring -- we each bring our unique talents and perspectives and have been working together to try to create something that we hope will have lasting value for the Program going forward.

I'd also like to take a couple of minute to thank some people who aren't on the other slide. And that includes Amiko Mayeno, who was a health educator at DPH,

but has since moved on. And I'd also like to thank Robin Christensen who's here in the room.

Robin.

(Applause.)

MS. DUNN: And Robin has helped in many ways, and we'll continue to look to her for help on all the different ways that she has contributed to what we're doing.

I'd also like to acknowledge the work done by Health Research For Action at UC Berkeley. They were very important in our early work when we were scoping out the project, and also in doing some of the conceptual work for the interactive brochure.

And I'd also like to acknowledge the other Biomonitoring California staff and managers who have been extremely valuable in terms of giving us feedback on what we're working on, and also ideas for new content and new approaches to bringing this site to life, and acknowledge the Centers for Disease Control for some of the funding.

So now on with the show. Okay. So, here we are on our homepage. As you can see, at the top of the page, so there are images that rotate through in a sequence. And each one is designed to highlight different content on the site. And by clicking on the image, you'll be taken directly to that content.

Before I do that, I'd like to show you a couple other things here on the homepage. The content on the site is organized through these -- sorry, I'm having a little trouble with my mouse -- is organized through these tabs. And when you scroll over the tab, there's pulldown menus that show the information. And pretty much all of these different tabs have information, so that you can easily get to content on the site.

If you scroll down the site, there's also navigational information on the right-hand side. And then in the center of the slide -- center of the site, there's a description of the Program, a video about the Program, a basic introduction to what biomonitoring is, and then some of the information that you're used to seeing, "What's new".

So, one point I'd like to emphasize is that we've built the site with the idea of having room to grow. And we're adding new content, and are in the process of developing more. For example, we're planning to create resources for specific groups, such as participants, parents, and workers.

Now, this is the way you go to the interactive brochure, also now the biomonitoring guide. And as you can see, there's several different chapters, and each chapter has subchapters. And this is meant to be a way

for people to easily get into the content on the site. This one just a basic introduction here, there's a link to get to the video that was on the homepage. And this would be a way you could get to information about one of our projects. This is about the Guidance Panel. Here's a video of the Panel in action.

(Laughter.)

MS. DUNN: It's very dynamic.

(Laughter.)

MS. DUNN: It's a real nail-biter.

(Laughter.)

MS. DUNN:

PANEL MEMBER WILSON: Hey, easy.

(Laughter.)

MS. DUNN: And then this is a link to get to information about the meetings. So basically, this is a way for people to just start to dig more deeply into the site, but hopefully in a way that's easy to understand.

Another example of a chapter, what happens when someone is asked to be in a project. So there's just a description so people can be oriented. Some of these don't have links, but one of the nice things -- so the site is being developed in Drupal, which is a content management system. So that allows staff, as we go forward, to easily add information and make changes and

add additional links. And here, for example, biomonitoring test results. This is just an example graph, but in the future, this can be a place where people can get at results information. So we have in mind to make it as easy as possible for people to access the content on the site.

Just to give you an example of some of the content that -- you know, everything that's on the current site is being brought over, but here's an example of where -- it will just take a minute.

The content on the existing site has been jazzed up with some photographs. This is from our last Guidance Panel meeting.

So some of the new content on the site are these pages about the projects. So there's an archive of all the projects that we've -- that the Program has been involved in, both those that are completed and those that are ongoing. And each one has a description and a brief summary of it, and an image, so that you can navigate by images, if you're so inclined.

And then if you click on that title, you'll get to a page that's about the project. It gives you a bigger description. It gives you some specific information about each project, for example, who the participants are, when the samples were directed, and from where. And there's

these maps that pop up.

And then, as you scroll further down, here's the chemicals that are being measured in this project. And Laurel will be telling you more about the chemicals content.

Just to give you a different example, so some of the projects are laboratory collaborations. And you'll see the same kind of, you know, basic description. And this is just the project that we're involved in, and again the map. In this case, just the one chemical, set of chemicals -- group of chemicals being measured. And then there's additional information.

So this is the kind of field where we're bringing in, for example, the information that is presented at these meetings, that's otherwise very difficult to find, will be organized in this way directly under the project that it's relevant to, so that people can easily get at that kind of content.

And just also finally wanted to show you, this is just a basic page that gives all of our meetings past and present. But I thought it's pretty impressive for those of you who've, you know, been following the Program all these Panel meetings that we've been carrying out since the beginning of the Program, and they're all here.

So with that, I'd like to turn it over to Laurel.

DR. PLUMMER: It's so great to see it big like that.

(Laughter.)

DR. PLUMMER: So I joined the project really recently working on the website, but I've -- I'm a toxicologist, so I've gotten really interested in working on the chemical section. And it worked out really well for me to scoot in and help on that part.

So one of our goals for this website, I think, as Amy has kind of alluded to, is that we want to appeal to broad audiences. And I think some of the information we have we want to make sure that, you know, the public, participants, but also scientists and researchers find our site useful. And chemicals is one of the locations where we feel this is really important.

So under the chemicals tab here, you see we also have a dropdown menu, similar to the other tabs. We have five main sections of our chemical information. On the left side here, we have a page about our general chemical selection process. And then two pages here that go into a little more detail about what a designated chemical is, what a priority chemical is, and then kind of the last step in chemical selection, which is chemicals actually being biomonitored.

So to start off, I'm just going to show you our

chemical selection page. We've repackaged a lot of information that's contained in our data summary reports, legislative reports, and tried to make it into an understandable narrative here with incorporating links to other pages, so people can navigate around really easily. And we've also worked on developing a diagram to give people a general idea of, you know, how the SGP plays a role. I know the font is probably small for people to read. But it basically outlines the different stages that chemicals can move through before they're ultimately chosen for biomonitoring, if that's the ultimate endpoint.

And so this diagram appears also on the designated page, priority page, with those different sections highlighted to help people understand our process, because it's kind of complicated. So I won't go onto these pages. It's, like I said, similar with the diagram and some narrative.

And then we worked on highlighting the chemicals that we measure in our studies. So here's a page again with some narrative talking about how chemicals ultimately become biomonitored in our studies. For example, we have a link to the Scientific Guidance Panel here. You know, if you click here, it will go to the page about the Guidance Panel and explain what that is.

And then if you scroll down here's a list of

chemicals currently being measured in our studies. There's quite a few, and some of these, as you know, are like groups of chemicals for PFCs, and then others are just chemicals highlighted on their own.

And so I'm just going to click here on bisphenol A. And so this is a chemical page that it represents the type of content that will be on all of the chemical pages listed on the Biomonitoring California or chemicals being biomonitored page that we were just on.

So I'll just point out some main features. So obvious, the chemical name. We include for -- when appropriate, we include a structure or an representative structure. We indicate the status. These are links, so you can go to those designated and priority pages, and then back to the list of chemicals being biomonitored here. A little one-liner description.

Here, we have a really great feature where you can actually click to expand. And these are the fact sheets or, in some cases, updated versions of ones that were sent to our participants. And you can also click here to download a PDF.

And then we have a section on Biomonitoring California information. This, right here, is where we plan to post the results. And we're working again with Uli on developing the best structure for that. We have a

list of projects measuring the chemical, documents, presentations, and publications, a link to the meeting where the chemical was discussed, a search function for the entire Biomonitoring California website for information on the chemical, and then a section for external biomonitoring links, which, in this case, includes a link to the National Biomonitoring Program carried out by CDC and also some links for the Minnesota Department of Health.

And so -- okay. So the next page I'm going to show you really briefly is one that is still under development, but this will give you a general idea. For the researchers and scientists, we really wanted to have this chemical index, so they could easily quickly find chemicals of interest. And we are allowing -- we've created three different ways to search.

So you can search by chemical name, CAS number or keyword under here, if you know exactly what you're looking for. You can scroll by chemical -- and pick by chemical name, and this will expand as our pages become more and more populated with information, or you can choose by keyword as well.

So the last thing I'll just highlight is on the chemical pages, we have some quick links -- quick chemical links here on the right, where you can get to the

chemicals being biomonitored in California page. Another link to the chemical index, and then the standard links that many people are probably used to visiting, the designated list, and the priority chemical list, which you can also get to from the designated and priority chemical pages. So there's lots of different ways to move around the site, as Amy mentioned.

And here we also have another chemical link here. So we hope people can find the information they're looking for easily.

So that's it for me. Amy, did you want to wrap it up?

MS. DUNN: Yeah. So, as I mentioned, we're planning to do some testing. And in addition to any comments you have on the website, we would love to have any thoughts that you have about how we might reach out to do that testing and to get people interested in coming to our new site when we launch it. So that's it.

CHAIRPERSON LUDERER: Great. Thank you very much Amy and Laurel. That was great.

(Applause.)

CHAIRPERSON LUDERER: Very exciting to see the new website and all the features. And I'm sure you want to hear feedback from the Panel. We have time for questions and discussion from Panel members.

Dr. Quint.

PANEL MEMBER QUINT: It looks great. This is Julia Quint. I just have a question. I'm forever looking for your tox summaries that you do for the meeting. And it wasn't clear to me on the chemical page that I could pull up some of the, you know, information that you guys prepare for our meetings. I mean, I'm forever referring people to those sometimes and looking for them. So was that there and I just didn't get it.

DR. PLUMMER: Amy could probably answer this too, but -- so we did have a section -- we will have a section on each chemical page that's publications, documents, but you'll also be able to access it through the meetings pages. So the same way you do currently.

PANEL MEMBER QUINT: Yeah. Sometimes I have -- I find it cumbersome.

MS. HOOVER: Laurel, can I comment

DR. PLUMMER: Sure.

MS. HOOVER: The reason you didn't notice it is because the example we used was BPA. We don't have a document on BPA. That's why it didn't pop. So on another page it will be clear. So, yeah, it will go chemical by chemical.

PANEL MEMBER QUINT: And you -- so -- but you won't have a link to other information in -- if OEHHA has

other information on a particular chemical that also happens to be biomonitored, because you guys --

MS. HOOVER: You know we actually spent a lot of time on that. We had -- originally, we had a section on the website where we were going to highlight links from the three departments OEHHA, DPH, DTSC. It turned out to be very complicated to -- well, there's a few issues. One of the issues is to pick out which documents, you know, to pull over. So, Laurel, actually spent an enormous amount of time doing that.

But then it would be a constant issue of updating. You know, changing links and adding to them. So we haven't abandoned that idea of adding more links from some of our relevant documents and so forth. We just haven't figured out a really great way to design that. And, Laurel, did you want to add anything?

DR. PLUMMER: I mean, my biggest problem with how we had it was just it didn't look -- I didn't think it looked that good, because the names of a lot of the scientific documents are quite long. And so we're just kind of working with Uli and trying to figure out a more visually appealing way, because the -- we wanted the information on there to be really strong and clear, and we didn't want to dilute it, but I agree that it's important to have that.

PANEL MEMBER QUINT: And I was just thinking within OEHHA, not necessarily the other departments, but I guess that's because I'm always on their looking for information.

MS. HOOVER: Well, I mean, we did find -- you know, we actually worked with Michael DiBartolomeis to identify some relevant DPH links. It is -- I mean, the chemical-specific content is largely -- would largely be OEHHA. So, like I said, we haven't abandoned that right at the moment. So in other words, we thought about -- we had our external links focused on biomonitoring -- you know, external biomonitoring links. We could have, you know, other relevant links or something at the bottom of the page, so we're still debating how to handle that.

PANEL MEMBER QUINT: I have one just other question sort of related. You know, part of the mandate is to monitor whether or not different regulations are being are effective or, however, you know, the banning of the certain flame retardants. And I'm wondering if there's going to be someway for us -- for people to get information on -- we're biomonitoring for this chemical but we've also had this initiative -- I mean, you know, some policy that has -- like Perc is going to be banned in dry cleaning. So I'm wondering if there's someway to connect the dots here.

So, you know, so that people can see -- you know, so you can -- so, you know, as somebody said that you know levels are going down because we did a certain -- took a certain action. So I guess is there some simple way to tie those two things together?

MS. DUNN: I think what you're raising is a really important point that hasn't been on our radar, but that is to bring that kind of policy information, at least links, to it into a section on the site. I don't think currently -- we haven't really been doing that. But I mean I think for the ones where it's straightforward to do that, like flame retardants.

MS. HOOVER: Yeah. No, I would say it definitely has been on our radar. And one of the things was like choosing where to link, you know, green chemistry, for example, figuring out how to do that.

For flame retardants, that's a good example, we are planning -- so, for example, for PBDEs when we describe PBDEs, we talk about like the regulatory status of PBDEs, but we're planning on adding a comment about the new BFRs and the new PFRs, right? So that would be on the PBDE page, so that people would start to -- because we don't want to leave it -- you know, the problem -- I mean, you're right, if you just do it chemical by chemical and very flat, then people don't figure out, well, okay, gee

PBDEs are done, so all is well. No, all is it not well, you know, go over here.

So I think we have that vision. Like Amy said, we haven't worked it out, and there's complications in what to link to and where to go to.

MS. DUNN: I guess the thing that I meant when I said we haven't had it on our radar in the sense of a place on the site to start pointing to where regulation is going in relation to the chemicals, instead of going chemical by chemical to actually bring in that piece of the Program's mandate.

MS. HOOVER: So you mean like an actual regulations page, like in resources or something maybe like that.

MS. DUNN: Yeah.

MS. HOOVER: No, that's true. I was thinking more on a chemical by chemical basis. I mean, Amy and I had quite a long -- a lot of discussions about green chemistry and how to handle that, and how to bring that in. So it's an ongoing discussion, but we'll keep that in mind.

PANEL MEMBER QUINT: Okay.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: Yeah. Thanks.

I had two questions. And the first one is really

a follow on to Dr. Quint's. I had the same impression that it might be interesting on the site, under the resources section, to have something that steers people to the other California chemical management programs, you know, or some other phrase, and that where -- and rather than sort of just a list of all these programs like the Cosmetics Program, you know, and the Safer Consumer Products, and Cal/OSHA, PELs. And rather than just a list, it would take them to a place that says, you know, workplace, you know, personal care products, you know, consumer products and what are the State programs that are relevant to those topics areas, and just link out to those things. So that was one thought.

And then the other was I was just curious about the -- you know, you mentioned you wanting to have a section that makes it relevant in a way or accessible to workers. And so I'm just curious if that's up now, or if it's, you know -- so if we were to steer our people from this steel workers, you know, to this page, is there something that they can go to and said, oh, this is how it relates to my work environment?

MS. DUNN: Well, the short answer is no, it's not currently on the site. But one of the challenges that we're facing in getting the site ready to launch is when is it good enough to launch? And I think our current

strategy is to get it -- make it public as soon as it's really, and then we're -- we have -- that is -- we have funding to work on that kind of -- those kind of resources. And we're planning to develop those in the next year or so. You know, as we go forward, we have that in our sites to start creating pages that will be relevant to people like you're mentioning. Yeah.

PANEL MEMBER WILSON: Yeah. Just I completely support that approach, you know, because, yeah, you could work on it for the next couple of years and not get it up. And it's beautiful. It's really, just visually, and the way it operates, it's really a nice -- really nice work product. So, yeah, I would support that moving it to launch sooner than waiting.

MS. DUNN: Thank you.

CHAIRPERSON LUDERER: Any other comments or questions from Panel members?

Dr. Kavanaugh-Lynch

PANEL MEMBER KAVANAUGH-LYNCH: Mel Kavanaugh-Lynch. I don't know if this is -- if you're allowed to do this or whether it's advisable to do this, but I'm aware of some fact sheets and things that are very consumer friendly that are done by other organizations. For instance, I know in the breast cancer world, Breast Cancer Fund has done some great publications and some --

and has a great website. Some of the NIEHS funded Breast Cancer and the Environment Research Programs have some good fact sheets that are made for consumers. Can you link to those? Is that okay to link to non-State things or --

DR. PLUMMER: Yeah, I mean, as far as I know it's okay. I think in developing our fact sheets, we've used those fact sheets from Breast Cancer Fund and NIEHS, and DPR, and an abundance of other fact sheets to create the ones that we have posted. So that's definitely an idea we can take into consideration.

MS. HOOVER: Just to add to what Laurel said, we didn't just take it into account. We actually have links. We have "For More Information", so we actually spent a huge amount of time in the fact sheet development, where we would search for all available fact sheets. We would read them, and see if we thought they were reasonable. And we would link to them, given certain criteria.

So we have done that. There's definitely going to be more out there. So if when the site goes live and, you know, you may notice, oh, what about this one? That would be helpful actually. So we've tried to do that, and, you know, we are constrained to some degree in terms of which ones to link to, because we don't want to imply an endorsement. So we link to certain things where we

feel comfortable linking to.

Even some of them that we're linked to, they may be a little out of date. We may not entirely agree with what's there, but we feel comfortable like linking to a CDC fact sheet, or an ATSDR fact sheet, and, you know, just representing it as coming from them.

PANEL MEMBER KAVANAUGH-LYNCH: Great.

CHAIRPERSON LUDERER: I just had a follow up actually to Dr. Quint's comment about the linking to OEHHA other OEHHA documents about particular chemicals. And I was wondering with it might be possible on that chemical search page to have an option of like search the OEHHA site for information -- additional information about this chemical or something. You know, just trying to think about ways you could do that.

DR. PLUMMER: Definitely, yeah. We had that for a while. And the problem we ran into was that I think that option will be a lot better when the OEHHA site undergoes its --

(Laughter.)

DR. PLUMMER: -- inevitable migration. Just because there's --

(Laughter.)

DR. PLUMMER: One of the things that we found is that, you know, random public comments was like the first

thing that would pop up. And so, you know, and that's just a function of how things, you know, are entered. And it's a challenging thing, but that's how I found, you know, the few that -- like a few OEHHA documents that I wanted to highlight, but I was a little more stringent in that decision process.

MS. HOOVER: So just one thing to add to that. Yeah, we had this wide open search, which definitely didn't work, but then Uli said that we can actually put filter properties on that. So we're -- that's something we'll play with to see if we can actually create a search that filters it, and actually gives us more of the results we want.

And then that would be actually a great way to link to OEHHA documents, because then we don't have to update it. It will just give a current search. So we're going to try that, but that's like an under construction thing.

CHAIRPERSON LUDERER: Great.

All right. Do we have any public comments for this presentation?

No.

All right. Well, yes we are -- we're actually ahead of time.

(Laughter.)

(Applause.)

MS DUNN: I guess I was wondering if the Panel might have any suggestions about when the site is live, if you have people that we would send the announcement to or people who you might want to connect us with to -- that you think we would want to test the site with, for example, who we might want to -- you know, who we might otherwise not have contact with.

I mean, you don't have to give them to me now verbally, but if you could -- actually, this goes for anyone in the room, and there's the sheet at the back that's pink, and you could just check the box that says contact me to connect you with some other people. So that would be really helpful.

CHAIRPERSON LUDERER: Just one question. Are you planning on contacting some of the -- there are different community groups that have come to Scientific Guidance Panel meetings that are interested in the Program. Are you going -- I mean, that might be a good resource to go back and contact them, and ask them for their input.

MS. DUNN: Yeah. That is a good idea. I mean, mostly those people are on our listserv, so we'll be reaching out that way. And I just want to mention, so I showed you this postcard, and I believe Dr. McKone handed these out. And we handed -- at one of the meetings he

attended, and we handed these out at a bunch of meetings in the latter part of 2012. And we do have some people who've signed up as interested, but, you know, it's -- you know, it's one of those things where if you only test the site with the people you already know, you're not really getting a full view.

CHAIRPERSON LUDERER: Dr. Quint.

PANEL MEMBER QUINT: Yeah, just briefly. You know, there are programs like the Environmental Health Tracking Program who have stakeholders who have lots of connections to community groups and things like that. So I think, you know, just within CDPH, and the Occupational Health Branch has a contacts database, and -- you know, of different types of organizations and groups. And so I think you might be able to extend it out a lot, if you just check in with some of those programs, but I'll fill out one of the forms.

MS. DUNN: Thanks. Those are great suggestions.

Thank you.

CHAIRPERSON LUDERER: Any other suggestions?

Okay. Sara, did you have --

MS. HOOVER: No, no, no. I was just going to help with the next presentation.

CHAIRPERSON LUDERER: Okay. All right. Thank you again for that presentation, and for all the wonderful

work on the website.

(Thereupon an overhead presentation was presented as follows.)

CHAIRPERSON LUDERER: So our next agenda item is a discussion of three classes of chemicals as potential priority chemicals. And Dr. Gail Krowech, Staff Toxicologist at OEHHA, will be presenting this talk.

Dr. Krowech.

DR. KROWECH: Good afternoon. So the purpose of this agenda item is to have the Panel consider three classes of chemicals as priority chemicals, non-halogenated aromatic phosphates, p,p´-bisphenols, and diglycidyl ethers of p,p´-bisphenols. And the second purpose is to get Panel input on future candidates for consideration as potential priority chemicals.

I want to just first remind the Panel of the criteria for recommending priority chemicals. They are: The degree of potential exposure, the likelihood of a chemical being a carcinogen or toxicant, the limit of laboratory detection, other criteria that the Panel may agree to. These criteria are not joined by ands and the Panel is not required to specify other criteria.

To give some background on screening and designation of non-halogenated aromatic phosphates, in March of 2011, we brought a screen of non-halogenated

phosphates to the Panel. The Panel was most interested in the aromatic phosphates and asked us to produce a document on them, which is what we did. In March 2012, the Panel recommended adding non-halogenated aromatic phosphates to the designated chemicals list.

With this slide, I'm just reminding you of the document that we produced on non-halogenated aromatic phosphates, and this contained information on potential for exposure, known or suspected health effects, and the potential to biomonitor.

In preparation for this meeting, we sent the Panel a table that was specifically focused on the potential for biomonitoring the aromatic phosphates. This is a summary of that table. And this table contains eight non-halogenated aromatic phosphates that were highlighted in our March 2012 document. All of these chemicals are either flame retardants or plasticizers or both, and all of them are high production value chemicals.

Two are substitutes for decaBDE in plastic housings for electronic equipment. That's bisphenol A bis(diphenyl phosphate), and resorcinol bis(diphenyl phosphate).

Several are used in polyurethane foam that we heard about this morning, and two are components of Firemaster 550. They are the isopropylated triphenyl

phosphate, which is a group of isomers, and triphenyl phosphate which is the bottom one on this list.

A few have been found in biomonitoring studies. Most of the studies have been with triphenyl phosphate. And the triphenyl phosphate metabolite diphenyl phosphate has been found in urine. And methods are currently under consideration.

With this page -- slide, I just wanted to update the Panel on new findings since March 2012, since these findings, this study, was from California. And Heather Stapleton actually talked about it this morning as well. Dodson et al. sampled dust from 16 California homes in 2006 and 2011. They measured three non-halogenated aromatic phosphates among the many flame retardants and some legacy pollutants that were measured. The three that were non-halogenated aromatic phosphates that were measured were 2-ethylhexyl diphenyl phosphate, tricresyl phosphate, and triphenyl phosphate.

All three were found in a hundred percent of the samples in both years. And the median levels of triphenyl phosphate were among the highest of all the flame retardants that were measured in this study.

I also want to report back from the symposium on flame retardants this past week in San Francisco, and to let you know that research on phosphate flame retardants

is pretty strong. It's a -- there's a lot of interest in it.

Two interesting studies, I thought I'd share. One, the two deca replacements, that I just mentioned on the previous slide, have both been reported to be found in house dust now. And another interesting finding is that triphenyl phosphate and one of the isomers of isopropylated triphenyl phosphate were found -- were reported to cause cardiac abnormalities in zebrafish embryos.

There were a couple of biomonitoring studies as well, and the same -- the same aromatic phosphates were being looked for and found.

So I'll stop here for any clarifying questions on the non-halogenated aromatic phosphates.

CHAIRPERSON LUDERER: Any clarifying questions from Panel members?

DR. KROWECH: Okay. This slide shows example structures of p,p´-bisphenols and diglycidyl ethers of p,p´-bisphenols.

In March 2012, we presented a preliminary screening table on bisphenol A substitutes and structurally related compounds. And an interim update on additional screening of BPA substitutes and related compounds was presented in July 2012. The Panel

recommended adding p,p´-bisphenols and diglycidyl ethers of p,p´-bisphenols to the designated list in November 2012.

And again, this is just a reminder of the document that was produced, which contained information on potential for exposure, known or suspected health effects, and potential to biomonitor.

And this table focuses on the potential to biomonitor. All of these p,p´-bisphenols were highlighted in the document. A couple have been found in biomonitoring studies. And as Jianwen talked about earlier, a method is under development to measure several of them. And that method can be expanded to include more compounds.

And here is the same table -- a similar table for the diglycidyl ethers of p,p´-bisphenols. And the two highlighted chemicals BADGE and BFDGE were highlighted in the document, both are used to make epoxy resins. The method that's under development currently at EHL also includes a method to measure BADGE in urine. And most recently -- recently, BADGE has been found in urine that Jianwen also mentioned this morning.

And here's a little bit more on that study published in late 2012. Wang et al. measured BADGE and three derivatives that are specified on the bottom, in

dust and urine. These derivatives are formed inside food cans and potentially in the environment. And together, referred to here as BADGEs, were found in a hundred percent of the indoor dust samples and a hundred percent of the urine samples.

And this table shows a comparison of the levels in urine in New York -- from adults in New York and the sample in China. You can see that the total BADGE level is higher in New York. And then the bottom row for comparison, levels of BPA in adults, the most recent NHANES levels, again BADGEs and, you know, including derivatives are higher than BPA.

And I'll stop here for clarifying questions.

CHAIRPERSON LUDERER: Dr. Bradman and then Dr. Wilson.

PANEL MEMBER BRADMAN: I have questions here about the laboratory methods. And this also applies to the previous set too as the same basic question.

For the bisphenols, is that -- would that -- would those analytes come out in the same analysis with the bisphenol A or would they be separate analyses for either the BADGE compounds or the p,p´-bisphenols? And then similar for the non-halogenated aromatic phosphates, it says method development is currently under consideration is -- again, are these measured as a group

and with other compounds or are they independently tested?

DR. SHE: Eventually we should -- we like to combine the groups. We'd like to combine the two methods as a group. But, at this moment, because laboratory testing, we already finish the environmental phenols as a searching chemical in that group. We already have a method.

With this new chemical, this BADGE and the other ones, right now we test it on the instrument -- different instrument. And also we need to test the sample clean up to make sure we can get the analyte enriched from urine. So right now is two separate methods.

The second method covers BADGE and the other environmental phenols. If we're able to, in the future, able to combine them together, we would like to do that.

And another thing that, you know, all of this BADGE New York measured, they do not have the -- standard. usually, BPA has a standard. So with the current method, we also included BPA. So BPA is currently in both of the methods because of standard issue.

PANEL MEMBER BRADMAN: Okay. Thank you.

CHAIRPERSON LUDERER: Dr. Wilson and then Dr. Quint. Dr. Quint and then Dr. Wilson.

PANEL MEMBER WILSON: That answered my question actually. Thanks.

PANEL MEMBER QUINT: And you may have answered mine as well. This is Julia Quint. I really like the Wang paper, because of all the -- measured a lot of the derivatives. And there was a lot of information potentially that could lead to, you know, how these levels -- the different levels and different people, the age, gender, et cetera.

So the question is whether or not we would be able to measure the different derivatives, free and conjugated, and, you know, have the richness of the data that Wang presented?

DR. SHE: Yes. We look at that method like we noticed it very challenging. Their limit of detection is 20 ppt. And based on our own experience you required, you have very clean environment.

So, at this moment, we don't how they did it, because they also found in the background for the BADGE. So the BADGE have a different form. BADGE plus two others, BADGE Plus one other on the hydroxy chloride.

So right now, we are testing them. Especially within this group, BADGE is the highest level that are identified. We have some technical issue we're still working on. We cannot find BADGE. We find other chemicals in our method. We have a BADGE standard, but we run on the instrument, the molecular peak don't show up.

Interesting it shows the molecular plus sodium, molecular peak of BADGE plus calcium and potassium. So that's some issue we're still working on.

And our long goal, we already purchase over 50 of these group of chemicals. So once we work out these five or six, we will broaden it to cover more, so you can see the different data, free ones. Can you get to the ones or conjugated ones. I hope that we can reach that goal.

PANEL MEMBER QUINT: Yeah.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: I have a question about the -- first, actually about the set of the non-halogenated aromatic phosphates. Is that -- is the set of potential priority chemicals in that group non-halogenated aromatic phosphates, is that a subset of the substances that were reported by Dodson et al. in their study of 16 homes.

DR. KROWECH: They looked at three of those chemicals, so, yes.

PANEL MEMBER WILSON: Okay.

DR. KROWECH: Yeah. So it is a subset and triphenyl phosphate is listed underneath the two brominated flame retardants from Firemaster 550. So it's not exactly clear that that's a non-halogenated aromatic phosphate, just -- I can show you where it is.

PANEL MEMBER WILSON: Okay. Thank you. I'm just trying to get oriented with what you did here with the paper. Okay. Thanks.

MS. HOOVER: Dr. Wilson, question.

DR. WILSON: Yes.

MS. HOOVER: Did you -- are you wondering about the other phosphates, like the chlorinated phosphates, or were you -- I just want to make sure we're answering your question, because there are -- they did other phosphates, right, they were halogenated?

DR. KROWECH: They did a lot of other phosphates.

PANEL MEMBER WILSON: That's where I'm confused.

MS. HOOVER: So we don't have -- so on our list, we don't have phosphate flame retardants. We have brominated and chlorinated flame retardants, which includes a bunch of phosphates in there. And then we have a separate group called non-halogenated aromatic phosphates. Now, with our new approach on our designated list, we actually could add another, you know, category called phosphate flame retardants. And have, you know, all of them, including, whether they're halogenated or not, listed in one box. So anyway if that's your question.

PANEL MEMBER WILSON: Well, it's -- yes. I mean, I guess when I see the paper that -- the Dodson paper,

they sampled for a lot of different kinds of, you know, basically alternatives or regrettable substitutions, I might say, for the -- following the PBDE phase out. And so -- and some of those are phosphates.

And I -- unless I'm reading it wrong, there are about 10 or 12 or something of the phosphates that they've -- that they sampled for. And then they have a whole set of other things. And so --

MS. HOOVER: But I think, Gail, don't those include both halogenated and non-halogenated phosphates?

DR. KROWECH: Right, but the section where they do the phosphates doesn't include triphenyl phosphate. They kind of have it in a different spot, because they have it with the Firemaster 550 brominated chemicals, so you're probably missing that. And that actually, you know, is at pretty high levels.

PANEL MEMBER WILSON: Right.

DR. KROWECH: The other two, tricresyl phosphate and 2-ethylhexyl diphenyl phosphate are with the phosphates.

PANEL MEMBER WILSON: Right. Okay. Thank you.

CHAIRPERSON LUDERER: And then I think we also said this morning that -- and on the designated chemicals list, the non-halogenated aromatic phosphates includes that whole class, even ones that are not explicitly listed

as far as the designated chemicals. And so if we --

DR. KROWECH: Yes.

CHAIRPERSON LUDERER: -- were to recommend moving those to the priority list, it would be the whole class, correct?

DR. KROWECH: Yes, right.

CHAIRPERSON LUDERER: Dr. Quint.

PANEL MEMBER QUINT: Julia Quint.

When Heather was presenting, she mentioned several times not on your list. And I was not keeping track, because I didn't have the color, so I didn't know which ones she was referring to necessarily. So my question is simply are we capturing the ones that she thinks are important or the ones that she's studying?

DR. KROWECH: Well, so there were two slides that she thought were not on our list. One I think was a question of nomenclature. And so that is actually included in tricresyl phosphate, the meta and the para, which is interesting that it's being found in foam, because there isn't anything in the literature saying that it is. And so that was really interesting, because it is one of the ones that is being found in dust. It's found in breast milk. So that was really interesting.

The other one was the (tert-butyl) phenyl diphenyl phosphate. And she showed a few isomers. So on

our list we just used one example of that. So even if we hadn't, it still would be included, but we picked a representative sample for that.

PANEL MEMBER QUINT: Sure. Thanks.

CHAIRPERSON LUDERER: Any other questions from Panel members before we move to public comments?

CHAIRPERSON LUDERER: Dr. Cranor.

PANEL MEMBER CRANOR: I'm sure you do this, but I'll ask, just in case. Do you coordinate with CDC, so that you're doing something in addition to what they're doing, so as it were the resources in the country are going further rather than duplicating what they do?

DR. KROWECH: Well, I think that's been one thing that's been very important for the Panel, to do -- to look for emerging chemicals, and to not necessarily just repeat. So we don't -- CDC is not looking for these.

PANEL MEMBER CRANOR: Good.

DR. KROWECH: But we are aware that NTP has been studying some of these, so there will be some more toxicology data on them.

CHAIRPERSON LUDERER: All right. Do we have some public comments?

All right. Do we have some public comments?

So we have two public comments. The first one is from Nancy Buermeyer from the Breast Cancer Fund.

MS. BUERMEYER: It's going to be a short comment.

Nancy Buermeyer the Breast Cancer Fund.

I actually spoke about this last time when you talked about making these priority chemicals. And that is our particular interest in replacement for BPA. We've run a long campaign to educate the community and the public about the dangers of BPA. And we get a lot of questions about, well, if they don't use BPA, what do they use?

And that has proven to be a very, very difficult question to answer, as I know Sara has found out from trying to beat the information out of the FDA.

So knowing the exposure pieces would be really, really helpful. Knowing sort of what are the exposures to people to some of these different compounds, it might help us to better understand what they are using. And as happened with BPA, I think the more you know about the exposures, the more interest you get from the academic and toxicology world, in general, to start looking at the possible health implications of these compounds.

And, you know, ultimate the goal is to have chemical policy management systems in place that require you to test everything before it goes into people's canned foods and the like. But we're not there today, so this is sort of a stop-gap measure to try to bring some attention to this and see if we can find out more information about

what these chemicals are really doing to people.

So we don't do a whole lot on flame retardants, although, recognize that they're evil.

(Laughter.)

MS. BUERMEYER: So we would sort of do a soft go for it on those, but would particularly want to focus on the p,p´-bisphenols. Did I get that right?

I have no idea what that means.

(Laughter.)

MS. BUERMEYER: But do that.

(Laughter.)

CHAIRPERSON LUDERER: Thank you very much for your comments.

And the next comment is from Renée Sharp from the Environmental Working Group.

MS. SHARP: Nancy and I are tag-teaming. This will also be a short comment.

MS. BUERMEYER: Thanks for calling me first.

(Laughter.)

MS. SHARP: We actually work on both flame retardants and BPA. And actually, it's for someone who's spent really, at this point, probably more than 10 years working to get both of those compounds essentially out of various products, it's particularly actually very painful to see the rise in the replacement compounds. And so I am

very thrilled that these are on your priority list.

And if for no other reason, I feel like it's an important thing to do, because we need to -- you know, we need to show over time, you know, the rise in certain chemicals in people. They decline as they're phased out, and the rise of new chemicals, because we seem -- it seems like we're still, unfortunately, too far away from actually getting TSCA reformed, which is our ultimate need and goal. So thank you.

CHAIRPERSON LUDERER: All right. Thank you very much. So now we have a little bit of time for some more Panel discussion. And then the Panel will decide what recommendations to make about these three different groups of chemicals, so the non-halogenated aromatic phosphates, the p,p´-bisphenols, and the diglycidyl ethers of the p,p´-bisphenols.

And we can make different recommendations on each of those three, so we don't have to do them all together.

Any comments, additional discussion from Panel members?

I mean, I think one thing that was very timely was that this morning we heard about all these non-halogenated aromatic flame retardants that are being found increasingly, and seeming to be replacements for the PBDEs.

As well as the bisphenol A substitutes. So you couldn't have planned those presentations any better as to how they linked into the afternoon ones.

(Laughter.)

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: I mean, I'm just going to say what is maybe on other people's minds, but just that, you know, we kind of set out early on as one criteria or at least guideline for choosing compounds for -- to make them priorities was that one exposure is -- common exposure is likely common, and two, that they might be more prevalent in California.

And it seems to me any flame retardant material is likely to be more prevalent in California. And given that these are potentially emerging compounds, or maybe they have emerged, but have not been evaluated, on a -- you know, a public basis, it seems to me they're kind of a natural class to move up to a priority.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: I would just -- just to add to that, you know, I was struck by the paper from Dodson et al. specifically to that point that there's a section in that paper called the flame retardant burden in California homes. And I'll just read one piece of that section which says that, "We found that...", and they list

the substances that they set out to identify, "...were abundant and commonly detected and we hypothesized that they are likely to be found in nearly all California homes. In our study, the levels of individual flame retardants in dust exceeded 0.01 percent with a cumulative level of all flame retardants almost 0.03 percent in one home.

Such concentration of flame retardants in dust is expected to lead to 30 micrograms per day flame retardant ingestion in a typical child. The average total load of flame retardants in house dust was approximately 80 to 90 micrograms per gram. And this was, you know, a paper evaluating these substances as a subset of a number of others that they evaluated that are existing substitutes, emerging -- actually I should say existing substitutes for the phased out PBDEs.

So I guess would -- I can, you know, just strongly concur with Dr. Bradman's point about exposure.

CHAIRPERSON LUDERER: Dr. McKone.

PANEL MEMBER McKONE: Yeah. Tom McKone.

I think -- I mean probably repeating what we've heard, but it's a very important issue, that in addition to the three criteria that we discussed, the Panel, since the beginning, has had our own criteria of making sure we're getting things that are on the upswing. We started

with actually I think siloxane type compounds was the first time that we went in and picked something that was -- you know, we picked it not because it was expected to be at high levels, but there was a big transition. We had this goal of looking for chemicals that were moving into the marketplace, so we could watch the transition, or lack of transition of it showing up.

And I think that remains an important goal of this, is not to just wait until everyone is saturated with something and go, oh, yeah, it's there, right and notice it, but to really see these trend lines early on. And we actually may be a little late on this one, but still I think that's been something we've thought about all along. And I think these seem to fall into that category, especially the transition in flame retardants, sealing materials, and the case -- it's not up to today, but the siloxanes, and their use in paper and copying products and things like that. We really -- I think we have to be watching for these and be aware of it.

CHAIRPERSON LUDERER: Dr. Kavanaugh-Lynch.

PANEL MEMBER KAVANAUGH-LYNCH: No.

CHAIRPERSON LUDERER: I thought you were nodding.

All right. Would anyone like to make a motion regarding the non-halogenated aromatic phosphates?

PANEL MEMBER BRADMAN: I'd be willing to do that.

So the motion would be that we are proposing to -- or recommending that these be moved to -- designated as priority chemicals for the California Environmental Biomonitoring Program. Do I need to -- is there any formal language we need to use?

CHAIRPERSON LUDERER: Maybe I can paraphrase. Dr. Bradman moves that the Panel recommend that the class of chemicals called non-halogenated aromatic phosphates be included as priority chemicals for the California Environmental Contaminant Biomonitoring Program.

PANEL MEMBER BRADMAN: That's exactly what I wanted to say.

(Laughter.)

PANEL MEMBER BRADMAN: Some day I feel unarticulate.

CHAIRPERSON LUDERER: Do we have a second?

PANEL MEMBER WILSON: I'll second.

CHAIRPERSON LUDERER: We have two seconds.

PANEL MEMBER CRANOR: Second.

CHAIRPERSON LUDERER: Do we have -- should we now go down the Panel.

Dr. Kavanaugh-Lynch would you like to start.

PANEL MEMBER KAVANAUGH-LYNCH: I'd love to start and I vote yes.

PANEL MEMBER McKONE: I vote yes. Tom McKone.

PANEL MEMBER CRANOR: I seconded it and vote yes.
CHAIRPERSON LUDERER: I vote yes.
PANEL MEMBER BRADMAN: I vote yes.
PANEL MEMBER QUINT: I vote yes.
PANEL MEMBER WILSON: Yes.
CHAIRPERSON LUDERER: All right, it's unanimous.
All right. Would any member of the Panel like to make a motion or do we have additional discussion regarding the p,p´-bisphenols?
PANEL MEMBER McKONE: I would like to make the motion, but I'll let you say the words --
(Laughter.)
PANEL MEMBER McKONE: -- because I'll never remember that.
CHAIRPERSON LUDERER: All right. Well, I have a cheat sheet here in front of me.
(Laughter.)
PANEL MEMBER McKONE: So I move that...
CHAIRPERSON LUDERER: Dr. McKone moves that the Panel recommend that the class of chemicals called p,p´-bisphenols be included as priority chemicals in the California Environmental Contaminant Biomonitoring Program.
Do I have a second.
PANEL MEMBER CRANOR: I second.

CHAIRPERSON LUDERER: Okay. We have a second.
(Laughter.)
CHAIRPERSON LUDERER: All right. We can start voting on this end.
Dr. Wilson.
PANEL MEMBER WILSON: Wilson, yes.
PANEL MEMBER QUINT: Quint, yes.
PANEL MEMBER BRADMAN: Asa, yes
CHAIRPERSON LUDERER: Luderer, yes.
PANEL MEMBER CRANOR: Cranor, yes
PANEL MEMBER McKONE: McKone, yes.
PANEL MEMBER KAVANAUGH-LYNCH: Kavanaugh-Lynch, yes.
CHAIRPERSON LUDERER: Unanimous again.
(Applause.)
CHAIRPERSON LUDERER: And finally, would anyone like to make a motion regarding the diglycidyl ethers of p,p´-bisphenols?
PANEL MEMBER WILSON: I'd be happy to make the motion that the Panel designate as potential chemicals that class diglycidyl ethers of p,p´-bisphenols for priority chemicals for the California Biomonitoring Program.
CHAIRPERSON LUDERER: All right.
(Laughter.)

CHAIRPERSON LUDERER: Dr. Wilson has made a motion that the Panel recommends that the class of chemicals called diglycidyl ethers of p,p´-bisphenols be included as priority chemicals for the CECBP.

And do we have a second?

PANEL MEMBER KAVANAUGH-LYNCH: Second.

PANEL MEMBER QUINT: I'll second.

PANEL MEMBER CRANOR: I'll second.

CHAIRPERSON LUDERER: Dr. Kavanaugh-Lynch, would you like to start?

PANEL MEMBER KAVANAUGH-LYNCH: Yes.

PANEL MEMBER McKONE: McKone, yes.

PANEL MEMBER CRANOR: Cranor, yes.

CHAIRPERSON LUDERER: Luderer, yes.

PANEL MEMBER BRADMAN: Bradman, yes.

PANEL MEMBER QUINT: Quint, yes.

PANEL MEMBER WILSON: Wilson, yes.

CHAIRPERSON LUDERER: All right. It's unanimous.

(Applause.)

CHAIRPERSON LUDERER: All right. Dr. Kavanaugh-Lynch.

PANEL MEMBER KAVANAUGH-LYNCH: I just wanted to thank the -- I'm grateful for the materials we got provided ahead of time, which made all this much easier.

CHAIRPERSON LUDERER: Absolutely. Thank you.

PANEL MEMBER WILSON: Just to add to that, it absolutely makes our job easier to be able to come with everything that you've done to help us prepare. So very much appreciated.

DR. KROWECH: There's one more item on our list tonight or today, which is that in preparation for this meeting we sent you an updated designated chemicals list. So we'd like to know are there additional designated chemicals that the Panel would like to consider in future meetings as potential priority chemicals?

CHAIRPERSON LUDERER: I don't know if any of the other Panel members had this question, but I was -- thought it would be helpful to know which ones of these are already on the priority list? I'm not sure that we're --

DR. PLUMMER: I made copies of that. And so it actually should be with your packet, if not inside the folder, underneath it.

CHAIRPERSON LUDERER: I was looking for it, because I knew you said you were going to do that, but I didn't see it.

DR. PLUMMER: I put one on everyone's spot.

PANEL MEMBER QUINT: Yeah, you did. You can look at mine, if you want.

DR. PLUMMER: That was a great suggestion.

DR. ZEISE: Tell us what it looks like?
CHAIRPERSON LUDERER: Yeah what does it look like?
PANEL MEMBER QUINT: It has priority on it.
DR. PLUMMER: It looks like the designated list, just it says priority list.
CHAIRPERSON LUDERER: I don't think I have it.
DR. PLUMMER: There's some on the back.
MS. HOOVER: I have extra copies.
CHAIRPERSON LUDERER: I guess I just don't have it.
MS. HOOVER: Anybody else need a copy?
DR. ZEISE: Sara, can I just have a copy?
MS. HOOVER: Yeah.
CHAIRPERSON LUDERER: All right. Dr. Quint.
PANEL MEMBER QUINT: So I'm not -- this is not a suggestion for a priority chemical, but it's a question about the status of chemicals on this list. We talked about diesel early, early on. And I was wondering if we have any information on an analyte or -- I think that was the question that we don't have an analyte for diesel that we feel confident about.
And occasionally I would just like to hear updates on some of these that are, you know, pending. And D5 is the other one that I'm interested in, for many

reasons. The phase out of Perc is one, but it's everywhere. And so, you know, from time to time, if we could just revisit some of those as we're doing the emerging ones, which I think is absolutely essential, that would be good.

And then if -- I do have a chemical that I'm interested in, and I'm not sure if it's within this program, but it's N-methylpyrrolidone. It's a solvent, and it's -- you know, toxicity-wise it certainly fits, but it's now -- it was one of the chemicals that EPA just did one of their first TSCA risk assessments on.

So it's -- you know, and with a specific use of paint stripping. It's a chemical that replaced methylene chloride, as most of you know. And they're looking specifically at -- they did a risk assessment specifically on paint stripping for both -- the risk assessment was on methylene chloride, but also on N-methylpyrrolidone. It's quite possible in the safer alternatives, green chemistry regulation that one of the priority products might be paint strippers that contain methylene chloride. And I think NMP might be a substitute that people use, if that happens.

I'm interested in that one also because it -- a lot of the solvents are volatile and they don't show up in NHANES. This chemical is skin absorbable. It isn't very

volatile, and so skin absorption is the main route of exposure. So at some point, maybe we could have -- and this may not be the time for it -- and it's totally unregulated. Certainly in occupational health it's unregulated, and there's not much -- there isn't a big profile. It's not on TAC list or anything like that. So anyway, that's my chemical.

MS. HOOVER: Okay. So I just wanted to clarify that that's great. We'll take note of that. This particular item is for priority, which means it needs to already be on the designated list. So, you know -- but now you've made the suggestion that we could look into for possible designation. And we also take note of your request for updates on others, and we'll do that.

PANEL MEMBER QUINT: Thank you.

CHAIRPERSON LUDERER: Apropos of updates, another group of chemicals, which was in one of the Wang et al. references that you -- that was included in the documentation for the BADGEs was the parabens, which is already on the priority list, but there was some really interesting data on there that the concentrations in house dust were really, really high. They estimated intake would -- based on the house dust concentrations would be like 1,000 nanograms per kilogram bodyweight per day in U.S. and that it's very high -- they're very high in the

personal care products and the cosmetics. So I think, you know, that might be something to revisit as well.

MS. HOOVER: When you say revisit, what do you mean? We are measuring -- we are measuring parabens.

CHAIRPERSON LUDERER: Are we currently --

MS. HOOVER: Yes.

CHAIRPERSON LUDERER: We're currently measuring?

MS. HOOVER: Yes, yes.

CHAIRPERSON LUDERER: Oh, okay. Great.

MS. HOOVER: Dr. She has a -- do you want -- that's part of the phenols method.

CHAIRPERSON LUDERER: Okay. I guess we just need to find some data on them?

DR. SHE: Yes. We currently measure four parabens, methylparaben, ethylparaben, butylparaben, and propylparaben. The highest level we found is methylparaben. It's much higher than any other environmental phenols within that certain chemical we measured. So the methylparaben's the highest one.

CHAIRPERSON LUDERER: Was that in one of the -- have we seen data on that? Maybe I was just forgetting it in the studies that --

DR. SHE: We did have -- we measured for the MIEEP study and the FOX study, but we are not ready to present. I hope the next SGP meeting we can present.

CHAIRPERSON LUDERER: Look forward to that. Thank you. Any other comments or suggestions for chemicals that should be moved from the designated to the priority list?

Dr. Wilson.

PANEL MEMBER WILSON: I guess, you know, in reading the Wang paper, I was curious if we've captured that -- you know, if we've adequately captured that, you know, class of compounds that are the, you know, substitutes for bisphenol A, in what we've just done?

MS. HOOVER: I can say that we have captured the entire class now of p,p´-bisphenols, diglycidyl ethers of p,p´-bisphenols. However, as Nancy Buermeyer was alluding to earlier, those are not necessarily substitutes for bisphenol A, and it's certainly not a complete capture of substitutes for bisphenol A. You may cast your mind back, way back, to our original preliminary screening table, in which Laurel actually did a broader capture of some of the other possible substitutes.

We have it sort of on our to-do list to circle back to the -- and then we narrowed down to the ones of greatest potential concern. And our original screen was actually substitutes and structurally-related compounds. So we're not necessarily calling -- so it's kind of a confusion that people commonly refer to all of these as

BPA substitutes, but, no, some of them were used, you know, along side of BPA. So they're not necessarily substitutes. Some clearly are, like BPS and thermal paper, you know, obviously a substitute for BPA.

So we gave it a different name, you know, to make it clear that we're identifying the chemical class. But we do plan to circle back and look at, say, other derivatives. So we picked out the diglycidyl ether derivatives, but we're aware of other derivatives of bisphenols. And then there's -- too much talking again.

Okay. It's cutting me off at a certain point, which is probably not a bad idea.

(Laughter.)

MS. HOOVER: Anyway, the diglycidyl ethers are one type of derivative. We're going to look at other types of derivatives. And then there's completely unrelated, you know, chemicals that have no relationship structurally to bisphenol A. And that's one of the research projects that Breast Cancer Fund is working on. So we're going to keep our eyes on that sort of thing too, that type of substitute, which would be a completely different document, research project, et cetera.

PANEL MEMBER WILSON: So that's -- if I could follow up, that's basically outside the scope of this discussion?

MS. HOOVER: Correct.

CHAIRPERSON LUDERER: Any other thoughts about priority chemicals from the Panel?

Dr. Quint had mentioned a suggestion for a designated -- potential designated chemical. One thing that I wanted to just suggest in that regard, since someone else already started suggesting other designated chemicals, was the organotins.

I know we had talked about them a long time ago in the context of their use as pesticides in California, and had said that they're not very widely used in California as pesticides, but I know there's some information that they may actually be in PVC plastics, which would be a much larger source of exposure for a lot more people than their use as pesticides. And there's all this very disturbing data about the triphenyltin and tributyltin being environmental obesogens. So I think that that would be something we might want to think about.

MS. HOOVER: Yeah, organotins are on our tracking list of to-do items.

I thought maybe what I could do is just give you an example of what we were trying to point to in this item.

(Laughter.)

PANEL MEMBER WILSON: Please.

(Laughter.)

MS. HOOVER: So just -- and this -- you know, it's fine if you don't have any suggestions or if you think about it later, and you come across something. But say, for example, in the metals, you know, originally the Panel went through and chose a few metals for priority. There's many more metals on the designated list, and metals that the lab can measure. So that's an example of something you might want to look through and see if there's other metals of interest to the Panel. Again, you do not have to do this today.

There's some example pesticides you might want to take a look at. So there's things -- you know, I know it's kind of hard in a way -- what we may be should have done is give you the list of things that aren't priority yet, which we could follow up with. We could do a compare and just send you the things that are not already priority, and have you comment on those.

So this is -- you know, we have plenty of work to do. We just wanted to give you an opportunity to bring out other things that may be are not on our radar screen.

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: Yeah. I guess, you know, in looking at the metals, in particular, you know that are on the designated list, are there substances there -- are

metals there that are of particular interest to OEHHA from the point of view of air pollutants, for example?

MS. HOOVER: So this item was just to give you guys an opportunity --

(Laughter.)

MS. HOOVER: -- to give us input. And we're not -- we don't have any input prepared for you, and I can't -- you know, I can't answer that question off the top of my head, but I can get back to you.

And just to let you know on metals, specifically Jed Waldman of EHL and I are planning to do a more thorough presentation of the designated metals, and tell you more about them, at some point. And we had talked about that before.

But we're just -- again, you know, I was just using it as an example, if you came across something in your research, oh, this metal is interesting. There's some interesting -- there was actually an interesting result. I need to get the details of it, but at the BFR. You know, there's some measurement of metals in a study in Vietnam, is that right? Yeah, a study in Vietnam of electronic recyclers, yeah.

So there are some metals that popped up there, but it went by so fast, we couldn't -- you know, we didn't have the details, so I'm going to track that down. So,

you know, there's options I think that would be of interest. But it really again -- you know, this was an opportunity just to let you tell us things.

CHAIRPERSON LUDERER: Dr. Cranor.

PANEL MEMBER CRANOR: You actually mentioned something that occurred to me when thinking about metals. Are there metals used in the electronic industry that are likely to have substantial exposure to recyclers or manufacturers that are not on the list? I don't know, but there are some pretty unusual metals out there, I think, and --

MS. HOOVER: You mean, the designated list?

PANEL MEMBER CRANOR: That are -- yes, that are not on this designated list, right.

MS. HOOVER: Right. Yeah. There are definitely metals that are not on the designated list that may be of interest. So that's another thing as a companion presentation, we could talk -- you know, there's a set on the designated list that could be moved easily to the priority, then there might be some candidate metals that we'd want to look at for potential designated.

PANEL MEMBER BRADMAN: I think it definitely would be helpful. You mentioned earlier about creating a list that's exclusively designated chemicals just to --

MS. HOOVER: No, you have a list that's

exclusively designated. You mean --

CHAIRPERSON LUDERER: You mean designated but not prioritized.

MS. HOOVER: I'm sorry. Designated only. Got it. Sorry.

CHAIRPERSON LUDERER: You know, just one thought on the metals. I've been seeing a lot in clinic. It's concerns about cobalt from metal hip implants and other joint replacements. So that might be one to consider. I think there is a lot of public interest and concern about that. The other concern with those implants that people -- the other metal is chromium, which is not on the designated list.

MS. HOOVER: Yeah, and chromium is one that, yeah, has come up as a possible thing to consider for designation.

PANEL MEMBER WILSON: I would --

CHAIRPERSON LUDERER: Dr. Wilson.

PANEL MEMBER WILSON: Yeah, sure. You know, you led us down this -- the path of metals, and now we can't seem to get off of it.

(Laughter.)

PANEL MEMBER WILSON: I think it's a symptom of being ill-prepared actually to answer this question. But I think there's -- something that is of interest is that,

you know, municipalities across the State are having to reach these, you know, zero waste objectives and continuing a reduction in their waste streams by State mandates.

And so it's requiring the emergence of a fairly robust recycling industry in California. And so the Bay Area Air Quality Management District is dealing with a question of metal emissions. And one of them is manganese, but I suspect there are others, and -- but this -- you know, this actually may be something that would fall within, you know, just the class of substances or pollutants actually that may be, you know, emerging in California as a result of the, you know, recycling and waste reduction standards that the municipalities have to reach, but that would obviously require some additional work to decide whether we would elevate one or more of those to a priority, you know, substance.

CHAIRPERSON LUDERER: All right. We have now some time allotted for open public comment period.

CHAIRPERSON LUDERER: Actually, this is public comment on this item.

CHAIRPERSON LUDERER: Okay. Public comment on this item. And then we have an open public comment period. Yes. Do we have two or one?

Nancy Buermeyer from the Breast Cancer Fund.

MS. BUERMEYER: Thank you very much. And I will preface my comments by saying I know just enough to be dangerous on this, so please bear with me.

But a couple of chemicals popped off the list of designated chemicals that I know we, at the Breast Cancer Fund, care a lot about. We run the Campaign for Safe Cosmetics, and looks specifically at a lot of chemicals that are in personal care products.

Toluene is one of those chemicals that shows up in nail polish and some other things. And that's been a chemical that we've been really concerned about. And I believe the Panel had a conversation about synthetic musks, at some point, but I don't see them on here. And that maybe because they are called something else, besides synthetic musks.

MS. HOOVER: No.

MS. BUERMEYER: But that is also something that we have continued to have concern about. But if it's not on the -- I guess that might be to say put it on the designated list, if it's not already there.

The other thing I wanted to say is a little bit prospective. There was a law that passed in 2008 that banned six phthalates in toys. And as a part of that law, it required the Consumer Product Safety Commission to put together a Chronic Hazard Advisory Panel, or a CHAP, to

look at the toxicity and the hazard data for the entire class of phthalates and phthalate substitutes.

That report is not out yet, but there is some thought that they will identify phthalates beyond the six that are in the law, that might sort of point us to some things that have more hazard data out there that we might then want to look at for exposure data.

So that report is not out. We're hoping to have -- it will come out this year, depending on how successful the American Chemistry Council is at delaying that. But in the meantime, I just wanted to sort of say, it looks like the phthalates here are only those designated. You didn't put them in as a class the way you did flame retardants.

So it might require going back phthalate by phthalate. But I just wanted to mention that, and say that we'll keep in touch when we hear more about what that report comes without with.

Thank you.

MS. HOOVER: So just one clarification. Yes, synthetic musks are on our list to do a designated document on. And that's coming up hopefully by November -- the November meeting. And thank you for the information on phthalates. And, yeah, that's actually another thing that you raise that's an important point,

which is some -- you know, you have to read our footnotes. Some of the classes on designated or priority are as a class, and some were those that were originally measured and listed by CDC. So that's another thing we could consider, which is go back and try to designate as a class. So phthalates is maybe a good one on that.

And you could look at things in that respect too, if there's things where you'd want to look at -- have us look at -- bring it back as a class, which we've done on at least one I know we did a document like that, where we turned it into class, pyrethroid pesticides, I believe.

Yeah. Now, I'm dangerous talking off the top of my head.

(Laughter.)

MS. HOOVER: Yes, pyrethroid pesticides is listed as a class now, which we brought a document on that for you.

CHAIRPERSON LUDERER: Okay. Do we have any additional public comments for the open public comment period?

No.

All right. Well, then I think we've actually finished a little bit ahead of schedule. So a transcript of this meeting will be available on the Biomonitoring California website in about a month, as always. And then

I want to remind everyone the next SGP meeting will be on August -- on Wednesday, August 14th at a new location, the California Endowment Oakland Conference Center at 1111 Broadway in Oakland. So we'll hear more about that as the date approaches.

All right. Thank you, everyone, for coming, and the meeting is adjourned.

(Thereupon the California Environmental Contaminant Biomonitoring Program, Scientific Guidance Panel meeting adjourned at 4:48 p.m.)

C E R T I F I C A T E O F R E P O R T E R

I, JAMES F. PETERS, a Certified Shorthand Reporter of the State of California, and Registered Professional Reporter, do hereby certify:

That I am a disinterested person herein; that the foregoing California Environmental Contamination Biomonitoring Program Scientific Guidance Panel meeting was reported in shorthand by me, James F. Peters, a Certified Shorthand Reporter of the State of California, and thereafter transcribed under my direction, by computer-assisted transcription.

I further certify that I am not of counsel or attorney for any of the parties to said meeting nor in any way interested in the outcome of said meeting.

IN WITNESS WHEREOF, I have hereunto set my hand this 25th day of April, 2013.

JAMES F. PETERS, CSR, RPR
Certified Shorthand Reporter
License No. 10063

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