MEETING

STATE OF CALIFORNIA

ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

ENVIRONMENTAL CONTAMINANT BIOMONITORING PROGRAM

SCIENTIFIC GUIDANCE PANEL

CAL/EPA HEADQUARTERS BUILDING

BYRON SHER AUDITORIUM

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SACRAMENTO, CALIFORNIA

THURSDAY, NOVEMBER 6, 2014

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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.

Oliver Fiehn, Ph.D.

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

Thomas McKone, Ph.D.

Megan R. Schwarzman, M.D., M.P.H.

Penelope (Jenny) Quintana, Ph.D., M.P.H.

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT:

Dr. George Alexeeff, Director

Mr. Alan Hirsch, Chief Deputy Director

Dr. Melanie Marty, Assistant Deputy Director, Scientific Affairs Division

Ms. Amy Dunn, Research Scientist III, Safer Alternatives Assessment and Biomonitoring Section

Mr. Mario Fernandez, Staff Counsel

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

Ms. Fran Kammerer, Staff Counsel

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

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. Michael J. DiBartolomeis, Chief, Exposure Assessment Section, Environmental Health Investigations Branch, Lead of Biomonitoring California

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

DEPARTMENT OF TOXIC SUBSTANCES CONTROL:

Dr. Myrto Petreas, Chief, Environmental Chemistry Branch

GUEST SPEAKERS:

Ms. Christine Arnesen, Arnesen Consulting

Dr. Chris Simpson, University of Washington

ALSO PRESENT:

Ms. Nancy Buermeyer, Breast Cancer Fund

Dr. John Collins, California Air Resources Board

Ms. Sharyle Patton, Commonweal Biomonitoring Resource Center

Dr. Chris Ruehl, California Air Resources Board

Dr. Veena Singla, Natural Resources Defense Counsel

Mr. Joseph Suchecki, Truck and Engine Manufacturers Association

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

DIRECTOR ALEXEEFF: Good morning, everyone. I believe we're ready to start. I'm George Alexeeff, Director of the Office of Environmental Health Hazard Assessment in the California Environmental Protection Agency. I want to welcome everyone, both here present physically and those present by the internet, which I believe is up and running.

And I want to welcome the Panel, Panel members up here for -- to the Scientific Guidance Panel for Biomonitoring California. I want to thank the Panel members for taking time out of their busy schedules to come here and give advice to the State, both the Health Department and CalEPA, in terms of the Biomonitoring Program.

And I want to, you know, remind everyone that the meeting is being transcribed, and it's also being broadcast via a webinar, so it's important that all comments be made using a microphone just so that everyone can hear what's being said.

I want to introduce a new Panel member, Dr. Megan Schwarzman over there, one from the left -- from your right, my left.

(Technical sound difficulties.)

MS. DUNN: It was me. I thought I put my

headphones in, but apparently it still broadcasts from here.

DIRECTOR ALEXEEFF: Okay. All right. We'll continue.

So I want to introduce and welcome the new Panel member, Dr. Megan Schwarzman. Dr. Megan Schwarzman is Research Scientist at UC Berkeley Center for Occupational and Environmental Health. She also serves as Associate Director of Health and Environment for the Interdisciplinary Berkeley Center for Green Chemistry tree, which she co-founded in 2009.

Her work focuses on substances that can affect the endocrine system, reproductive environmental health, U.S. and European Chemicals Policy, and how to use environmental health knowledge to design safety and sustainability into chemical building blocks of materials.

Dr. Schwarzman earned her medical degree from the University of Massachusetts, completed her specialty training in family medicine at the University of California, San Francisco, and earned a Master's of Public Health from the University of California, Berkeley.

She also serves on the Department of Toxic Substances Control's Green Ribbon Science Panel. In addition to her work at UC Berkeley, Dr. Schwarzman practices medicine part time at San Francisco General

Hospital. So we're very fortunate to have Dr. Schwarzman on this Panel.

So I'm going to now administer the oath to Dr. Schwarzman. So we'll both stand up. You can stand up over there and I'll stand up over here, and I will read this. And you can just repeat after me.

I, Megan Schwarzman --

PANEL MEMBER SCHWARZMAN: I, Megan Schwarzman --

DIRECTOR ALEXEEFF: -- do solemnly swear or affirm --

PANEL MEMBER SCHWARZMAN: -- do solemnly swear or affirm --

DIRECTOR ALEXEEFF: -- that I will support and defend the Constitution of the United States --

PANEL MEMBER SCHWARZMAN: -- that I will support and defend the Constitution of the United States --

DIRECTOR ALEXEEFF: -- and that the Constitution of the State of California --

PANEL MEMBER SCHWARZMAN: -- and the Constitution of the State of California --

DIRECTOR ALEXEEFF: -- against all enemies, foreign and domestic --

PANEL MEMBER SCHWARZMAN: -- against all enemies foreign and domestic --

DIRECTOR ALEXEEFF: -- that I will bear truth

faith and allegiance --

PANEL MEMBER SCHWARZMAN: -- that I will bear truth faith and allegiance --

DIRECTOR ALEXEEFF: -- to the Constitution of the United States and the Constitution of the State of California --

PANEL MEMBER SCHWARZMAN: -- to the Constitution of the United States and the Constitution of the State of California --

DIRECTOR ALEXEEFF: -- that I take this obligation freely --

PANEL MEMBER SCHWARZMAN: -- that I take this obligation freely --

DIRECTOR ALEXEEFF: -- without any mental reservation or purpose of evasion --

PANEL MEMBER SCHWARZMAN: -- without any mental reservation or purpose of evasion --

DIRECTOR ALEXEEFF: -- and that I will well and faithfully discharge the duties which I am about to enter.

PANEL MEMBER SCHWARZMAN: -- and that I will well and faithfully discharge the duties upon which I am about to enter.

DIRECTOR ALEXEEFF: Thank you.

(Applause.)

DIRECTOR ALEXEEFF: All right. At our last SGP

meeting, it was held in Oakland in -- July 10th 2014. The Panel received Program and Laboratory updates, including some recent biomonitoring results and provided input. We held a special session about exposure to chemicals and consumer products, and discussed ways that Biomonitoring California can work with other State programs, such as the Safer Consumer Products Program, and the Safe Cosmetics Program to better achieve common goals.

The Panel, the audience, and our distinguished guest speakers, including Ms. Claudia Polsky of the California Department of Justice, Dr. Thu Quach of the Cancer Prevention Institute of California, and Dr. Meredith Williams, Deputy Director for the Safer Products and Workplaces Program of the Department of Toxic Substances Control provided advice on this important topic, and action items that the Program staff are actively working on. For example, the Program staff are reviewing consumer product chemicals that are not currently included on Biomonitoring California.

And for more information about the July meeting, please visit the biomonitoring website at biomonitoring.ca.gov.

So just a few logistics announcements. Restrooms located out the back door and to the left. I want everyone to notice the emergency exits in case they're

needed. There's five exits here.

And now, I want to turn the meeting over, which I think is going to be really exciting, because it's on -- going to be focusing on diesel exhaust in the afternoon. I want to turn it over to Dr. Ulrike Luderer.

CHAIRPERSON LUDERER: Thank you very much, George. I would also like to welcome everyone to the meeting, members of the public that are here, and listening via webcast, Panel members and Program staff as well.

I'd like to just briefly outline what the goals are for the meeting today. So the Panel will receive Program and Laboratory updates and provide input, and specifically the Program update will include a presentation from Christine Arnesen, a consultant for Biomonitoring California, about her evaluation of the Program's activities under the Five Year Cooperative Agreement with the Centers for Disease Control and Prevention.

We'll also hear this afternoon, as George already alluded to, presentations from two guest speakers on challenges in measuring exposure to diesel exhaust and possible biomarkers, and participate in a discussion on strategies to study communities highly exposed to diesel exhaust. We'll also provide input on Scientific Guidance

Panel agenda items for 2015. And finally, we'll -- some additional Panel business, I prepared a letter on behalf of the Scientific Guidance Panel to support Program funding as we had discussed at the last meeting. A copy of the letter is in your packets and is also available for viewing at the table in the back of the room. We set aside some time at the end of the meeting for Panel members to sign it.

For each of the agenda topics, we'll have -- we have time provided for Panel questions, public comment and Panel discussion and recommendations. So I wanted to briefly review how we'll be handling public comment. If a member of the public would like to make a comment, he or she should please fill out a comment card, which can be obtained from the table in the back of the room. Amy Dunn is holding one of those up right now. And you can turn the cards in to Amy.

Members of the public who are not here in person, but are participating via webcast, are invited to provide comments via email to biomonitoring@oehha o-e-h-h-a .ca.gov. Biomonitoring California staff will provide the emailed comments to me, so that they can be read allowed during the meeting.

To ensure that the meeting proceeds on schedule and that all commentators have the opportunity to speak,

we will be subjecting the public comments to time limits. The time that's -- total time that's allotted for public comments will be divided by the number of commenters. So please keep the comments focused on the agenda items being presented. At the end of the day, we will have an open public comment period as the last item. I also wanted to remind everyone to remember please speak directly into the microphone and to please introduce yourself before speaking. And this is for the benefit of people participating on the webcast as well as for our transcriber.

The materials for the meeting today were provided to SGP members and posted on the Biomonitoring California website prior to the meeting today. There are a small number of hard copies of the presentations, and one sample SGP folder for viewing on the table at the back of the room. We will be taking two breaks today, one around noon for lunch and another one around 3:30 this afternoon.

So now I'd actually like to get into today's business. It's my pleasure to introduce Dr. Michael DiBartolomeis. He's Chief of the Exposure Assessment Section in the California Department of Public Health and lead of Biomonitoring California. Dr. DiBartolomeis will provide an update on Biomonitoring California activities and will introduce our guest speaker, Christine Arnesen.

Dr. DiBartolomeis.

(Thereupon an overhead presentation was presented as follows.)

DR. DiBARTOLOMEIS: I don't think this is on. Hello, yes. Well, good morning, Panel, and good morning everyone else in the auditorium, and good morning those of you who are on the phone. I will actually dive into this, because I have a very tight timeline.

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DR. DiBARTOLOMEIS: What I plan to do today is briefly cover some Program announcements and the project updates. I'm going to introduce you to our priority setting -- our Program priority setting process, and then I will turn the presentation over to Ms. Christine Arnesen.

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DR. DiBARTOLOMEIS: Okay. And so let me just go right into the announcements.

First of all a few personnel things I wanted to cover. We are happy to announce that we have two new State employees, Mr. Rob Voss and Ms. Duyen Kauffman.

(Applause.)

DR. DiBARTOLOMEIS: They were actually part of the Sequoia Foundation grant from the previous CDC grant, and they are now State employees. So that's the good news

for at least the Environmental Health Investigations Branch part of this.

Unfortunately, the Program overall has lost nine staff, mostly from the laboratories, and they will be -- there will be more about that in the laboratory updates, due to the funding reductions that occurred at the end of 2014 -- August 2014.

And from the Environmental Health Investigations Branch and part of the core of the Program, we lost Ms. Meredith Anderson and Ms. Nancy Lopez. So that's unfortunate.

I'm sure you're all wondering what's happening with the Legislative Report. And I thought I would just sort of tell you that really it appears that there's more activity now that there -- it is back into management review. I do think there's a good chance it will be released before the end of the year.

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DR. DiBARTOLOMEIS: We've already -- you've already mentioned Program funding in your opening remarks. I just thought I would once again cover where we are with this just to make sure we're clear. First of all, as you know, we have the $2.2 million of permanent State funding, which comes from various different special funds. None of this is General Fund. We also have received $700,000 per

year for two years, of which half goes to the Department of Toxic Substances Control and half goes to the Department of Public Health. We also -- there is a potential to be receiving, just in this fiscal year, another $400,000. As far as I know, it hasn't happen yet, but I don't believe it has been canceled either, so we still have that possibility. Although, the longer it takes, the less flexibility we have in spending that money obviously.

As I mentioned, at the -- as I announced at the last meeting, we did receive the grant award of $1 million per year for five years from the CDC, and I've also mentioned that it's a very focused scope of work. We are not going to be able to develop new methods with those funds, because of the way the scope of work is written and the limitations of the CDC funds.

But I thought I would show you a map of the United States, because I'm sure that you don't know what the United States looks like in a map. But what I wanted to show you that in 2009 to 2014, the blue states -- and this is not any political affiliation here. The Washington and New York and California actually received -- were recipients of the first five-year grants for biomonitoring.

The second grant went to the four corner states

in the western part of the United States, Virginia, and in New Hampshire, and Massachusetts, and New Jersey. And California is a weird color, because we're kind of blue green, because we also received funding in this second round, which is the only State to have funding in both rounds, so we're pretty honored in being able to have -- to achieve that.

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DR. DiBARTOLOMEIS: And just again to remind you, and maybe I haven't actually outlined these, the objectives or the strategies in our CDC grant this next five years are to continue to conduct statewide biomonitoring surveillance, to the extent that we can; target populations with State-specific or unique exposures; ensure high quality biomonitoring methods and results - none of these seem to be new - and engage participants, the public, and policymakers, which we hope to, you know, maybe expand a little bit in this, especially with the communities in this coming five-year cycle.

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DR. DiBARTOLOMEIS: With respect to project updates, again, I'm just going to be really brief here. With our Biomonitoring Exposures Study, we are -- in the Central Valley, again, we have the two different tracks.

With respect to the pilot study, data analyses are well underway for metals, polyfluorinated compounds, and our brominated flames retardants.

And we are planning -- and actually more than planning, we are starting the process of evaluating the results. In other words, we're starting to prepare the materials to submit to the IRB for an amendment. With respect to Expanded BEST, we have analyzed and returned the first set of results, and we are currently analyzing the second set of chemicals and performing data analyses on metals and PFCs.

With respect to the Genetic Disease Screening Program collaboration, we have the first 600 samples from the biobank identified. And it's my understanding, they're going to be delivered today, as a matter of fact. So one of our staff has stayed behind to receive those.

We have received Program -- I'm sorry, demographic data. And as I said, we're expecting sample delivery today. And we anticipate that the laboratory analyses for PFCs and metals will be completed sometime early in 2015. We might have something to report back in, I think, is March the next meeting? Yes.

And then the POPs will follow shortly.

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DR. DiBARTOLOMEIS: With respect to the

maternal-infant and firefighters studies, we're in the publication phase. And I believe that the first paper has been submitted to Environmental Health Perspectives for the MIEEP project. We haven't heard back as to what the status is, but that was submitted probably a good month -- solid month ago. And then, of course, we're still working on other publication possibilities.

With respect to the firefighters, we have actually a paper that is published. However, I don't think it has yet appeared online. I know it's like imminent. But I think we were checking on that yesterday, and I haven't heard back as to whether it is actually going to appear online. It will be in print probably four or five months from now. You know, how there's always a delay.

The second paper on FOX, I just looked at the -- I think, what is the final version ready to be resubmitted for -- after it's been, you know, reviewed, et cetera. We'll resubmit it hopefully for publication. That probably will be going this week or early next week.

And the third paper on benzophenone 3 and the other phenols was submitted to EHP a couple weeks ago or so, or maybe last week.

DR. SHE: Over the weekend.

DR. DiBARTOLOMEIS: Over the weekend. Okay.

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DR. DiBARTOLOMEIS: Now, due to the fact that we have some very -- some changing funding and our resources are more or less less than what we had before. We have initiated a priority setting process starting in January. We've actually had seven meetings already, three of those facilitated by external facilitators with various levels of management staff. And what we're trying to do is evaluate our funding that we have available, and figure out what our priorities will be in the coming months, and years.

And we are now in the process of wanting to get external feedback and external input, and then finalize the priorities and then develop action plans. I'm not going to be providing you any of our priorities, but I am going to tell you a little bit about some of the outcomes. We have been able to develop a tracking process that we use, and we call it The Matrix. And we have a practical vision, which I'm going to show on you slide 10.

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DR. DiBARTOLOMEIS: We've identified Program decision points, in other words, how we can be more efficient in making decisions and moving things back and forth easier. We have proposed new or continuing projects, which we call initiatives, which I will probably

give more on at the next meeting, develop criteria to screen them, which I'm going to show you a little bit about, and then selected priority setting -- priority setting activities for proposal.

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DR. DiBARTOLOMEIS: Our five-year vision for the Program would be that California would be sustainable -- Biomonitoring California would be sustainable, would have a lab infrastructure that is stable, responsive, coordinated, flexible, and sustainable; that it has a robust system in place to track unknown exposures; the findings are used to inform regulatory and public health action; that it's raising awareness of environmental health equity; and finally, is recognized as an essential public health function. So biomonitoring would be an essential public health function.

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DR. DiBARTOLOMEIS: The screening criteria that we're using, you can see there. They kind of mirror a little bit on the vision, but a little bit more. We want to be responsive to California issues. They have -- it has to be feasible, whatever we're proposing to do, obviously fulfilling mandates and then the others are more or less along the lines of the vision.

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DR. DiBARTOLOMEIS: Now, before I turn the talk over to Christine, I just want to -- I would like to take just a moment to introduce two new Department of Public Health senior managers -- sorry, I have to put my glasses on. First, let me introduce Dr. Kevin Sherin. He's in the back of the room.

Dr. Sherin is Deputy Director of the Center for Chronic Disease Prevention and Health Promotion. And prior to joining CDPH, he served as the director and Health Officer for the Florida Department of Health in Orange County, a position he held since 2004. Dr. Sherin has been involved both statewide and nationally with chronic disease prevention and health promotion, and he represented the State of Florida while addressing chronic disease, obesity, immunization, and health equity issues.

Dr. Sherin also has extensive clinical experience, including over 25 years of family medical practice. So welcome, Dr. Sherin.

(Applause.)

DR. DiBARTOLOMEIS: And I also would like to introduce my new boss, Dr. Janice Prudhomme, who is the Chief of the Environmental Health Investigations Branch, in other words Michael Lipsett's old position. Dr. Prudhomme's professional and academic background combines experience in nutrition, sports science, internal

medicine, occupational and environmental medicine, and her experience in training includes evaluating chemical exposures in working with NHANES data.

Prior to rejoining CDPH this year, Dr. Prudhomme was supervisor of Cal OSHA's medical unit, a position she held since 2009. And when I said rejoined CDPH, this is because from 2001 to 2009, Janice was a Public Health Medical Officer in the Hazard Evaluation System and Information Service section, otherwise known as HESIS, of the Occupational Health Branch, which I actually have had the opportunity to work closely with her for several years.

I believe both Drs. Sherin and Prudhomme share a common goal to continue to promote the work of Biomonitoring California, and build upon the solid foundation already in place. This includes helping ensure funding to support cross-state sampling that adds to existing available data and identifies hazards faced by California's most vulnerable populations in order to develop strategies and interventions to decrease identified pollutants, and improve health for all Californians.

With that, I would like to introduce Christine Arnesen, and I think somebody is going to come over here and flip the slides.

(Thereupon an overhead presentation was presented as follows.)

MS. ARNESEN: Thank you, Michael.

Good morning, members of the Panel and attendees here in the room, and those on webcast. I'm here to give a report on the evaluation of activities under the cooperative -- CDC cooperative agreement for the years 2009 to 2014.

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MS. ARNESEN: The purpose of this evaluation. First of all it was -- it meets a requirement of CDC to perform an evaluation. It is to assess Program success in meeting the objectives set forth in the CDC cooperative agreement, and also to provide recommendations for Program improvement.

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MS. ARNESEN: The methods used. There was extensive Program document review, including interim and annual reports, project protocols results, return materials. There's was quite a list of documents reviewed. There was an onsite laboratory evaluation, which was performed by a laboratory auditor. This was two days spent in each of the two laboratories looking at sample management, quality assurance, and also observing an analyst performing four different methods, urine

metals, OH-PAHs, PFCs and PBDEs.

There's also one-on-one interviews conducted, and there was an online survey. There were 25 one-on-one interviews, and 39 out of 47 online surveys were returned. This was to selected Program staff and managers, SGP members, external collaborators, and stakeholders.

The results from this document review, of the laboratory evaluation and the interview and survey results were integrated to develop the following findings and recommendations:

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MS. ARNESEN: First of all, the major finding is that Biomonitoring California achieved impressive accomplishments under each objective of the CDC cooperative agreement, and the Program made important contributions to public and environmental health.

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MS. ARNESEN: Now, I'd like to do findings and recommendations by objective.

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MS. ARNESEN: The first objective is establish laboratory capability, 14 classes of chemicals, and capacity, 13,000 assays per year, in human blood or urine.

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MS. ARNESEN: These are selected findings for

Objective 1. The laboratories exceeded capability objective. They have 16 classes of chemicals. They increased laboratory capacity significantly to 10,350 assays. Full capacity was not reached due to sample availability and staffing and equipment access.

They demonstrated the ability to complete major projects and laboratory collaborations. They completed sample analyses from over 4,000 individuals over the five years. And they achieved new efficiencies in laboratory methods. For example, the laboratory can now conduct simultaneous analysis of up to 12 metals with decreased analysis times and improved detection limits.

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MS. ARNESEN: Objective number 2, demonstrate success of quality management system to receive, transport, track, inventory, process, and analyze biospecimens, generate reports, and maintain biospecimen archives.

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MS. ARNESEN: Selected findings. These are findings from the laboratory evaluation. Quality systems for sample and data management at both the laboratories have consistently expanded and improved to meet the needs of the Program. Data quality is consistently supported by successful participation in numerous external quality

control and proficiency testing programs. And sample and data management of the four laboratory methods chosen for the audit were successful -- satisfactory.

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MS. ARNESEN: Objective 2 recommendations. These are priority recommendations that came from the laboratory evaluation. First of all, to develop a Quality Assurance Program Plan for the overall Program, achieve Environmental Chemistry Laboratory accreditation under ISO 17025, to better integrate biomonitoring activities into Environmental Health Laboratory's internal audit and management review process, and to improve documentation and decreased time necessary to finalize standard operating procedures.

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MS. ARNESEN: Objective 3, apply laboratory biomonitoring methods to assess and track trends in exposure levels for selected environmental chemicals among targeted populations, including vulnerable groups such as pregnant women and their infants.

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MS. ARNESEN: Selected findings for Objective 3 include, Program carried out complicated, large-scale, full project collaborations requiring coordination across multiple external partners and State departments. They

leveraged Program resources through laboratory collaborations, which contributed to building the capacity and capability and added to the results database. Measured priority chemicals in diverse population with varying demography, types of exposures, and geographic areas. They built a database of biomonitoring results that provides an initial picture of exposures in California. And they analyzed trends, where possible, for example, measured a decline in PBDEs in one study, providing evidence for the effectiveness of California's ban. And they're maintaining a biorepository of samples that can be analyzed for new chemicals of concern in the future.

In addition, interview and survey respondents spoke quite highly of the Program in relation to Objective 3, stating that the Program had done, you know, remarkably well at being able to identify and access targeted populations.

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MS. ARNESEN: Objective 3 recommendations. Strategically target new populations to add depth and breadth to the database of environmental chemical exposures across California; to continue to improve internal and external communication and coordination; identify opportunities to link exposure data, such as

measurements in dust, with biomonitoring results; and use results collected to date as a baseline for examining future trends in chemical exposures.

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MS. ARNESEN: Objective 4, assess exposure to and track trends in selected environmental chemicals in a representative group of Californians by determining the levels of those chemicals in biospecimens and determining the prevalence of levels above known toxicity or clinical action thresholds among California residents.

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MS. ARNESEN: Selected findings. The Program has doggedly pursued recommendations and opportunities to biomonitor a representative sample in the absence of full funding. Pilot and Expanded BEST provide data on adult Kaiser Permanente members in the Central Valley and will help inform efforts to approximate a sample that is representative of California.

The Program overcame significant obstacles to achieve collaboration with the Genetic Disease Screening Program; and laboratory methods for small volumes provide an avenue to measure chemicals in a representative sample of pregnant women through the archive samples now available from GDSP.

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MS. ARNESEN: Objective 4 recommendations are to continue efforts to obtain sustainable funding to measure chemicals in a representative sample of Californians; and, to build on BEST and GDSP collaborations to inform efforts to approximate a representative sample.

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MS. ARNESEN: Objective 5, demonstrate the ability to engage and collaborate with stakeholders and communities in exposure assessment investigations, and in the development of outreach and educational materials and results return materials.

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MS. ARNESEN: Objective 5, selected findings. The Program consistently followed through on their intention to engage with stakeholders and develop understandable materials for stakeholders, the public, and for biomonitored populations. For example, they developed the Public Involvement Plan, which became kind of the framework for public engagement activities for the Biomonitoring California Program. They convene these public SGP meetings and other workshops and provide opportunity for public input.

Launched a highly prized new website. It includes fact sheets and an interactive results database. Created a biomonitoring guide based on the Program

brochure, and this is in multiple languages and is also available on the website. And developed a template for results return materials with improvements based on usability testing that tailored the results return materials to each of the projects that they were returning results for. And they returned results to about 650 participants.

Results return is a worthwhile, but very resource intensive, effort. It's a unique highly-valued principle for the Program. And the availability of the template now with the fact sheets, everything kind of prepared, as well as automation in generating the packets to go out will provide new efficiencies and make it more cost effective.

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MS. ARNESEN: Objective 5 recommendations. Identify opportunities for additional stakeholder engagement; consider establishing an advisory body made up of stakeholders, the public, and others with expertise tuned to issues relative to community concerns, and to identify a sustainable funding source to do this; and, to utilize SGP members' expertise and networking potential to further publicize the Program.

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MS. ARNESEN: These are Program projects that the Program engaged in.

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MS. ARNESEN: And these are laboratory collaborations that the Program has been involved in.

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MS. ARNESEN: There's selected Program contributions to public and environmental health. For example, the identification of an elevated blood mercury in a San Francisco family, which prompted further health education efforts on adulterated face creams.

MIEEP demonstrated that infants have higher levels of certain chemicals than their mothers. FOX showed higher levels of PBDEs and BP-3 in firefighters, and also FOX found that the use of protective gear and following occupational hygiene guidelines could reduce the firefighter exposure to the flame retardants.

The downward trend in PBDEs in the small study of pregnant women provides evidence for effectiveness of California ban; Consistently lower levels of lead in California residents compared to the national surveys provides evidence that government initiatives have been successful; and, publicly available results inform California policy initiatives, such as the Safer Consumers Products Program.

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MS. ARNESEN: Lastly, these are some additional

recommendations that were made, and many of these the Program has already engaged in. Develop a program vision; develop a sustainability plan, including stable State funding; seek additional external funding; develop an evaluation plan, which is actually a requirement for the next CDC funding period; and, to strengthen relationship with external partners and stakeholders.

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Thank you.

CHAIRPERSON LUDERER: Thank you very much, Ms. Arnesen. I think I speak for the other Scientific Guidance Panel members when I say that we, at our meetings, have been impressed by the progress that the Program has made time and again, but it's really great to see it all laid out in such an organized and thorough way with the critical evaluation that you've done.

So we now have time -- it makes it even more impressive. We now have time for some Panel questions and then we'll take some public comments and then have more time for Panel discussion after that.

Any questions?

Dr. McKone.

PANEL MEMBER McKONE: A mix of a question, I guess, and a comment. I was recently involved in an effort in California, and the question came up about

capacity for chemical set -- a series of chemicals. And I realized one of the real advantages here is not only carrying out the assays, but having the capacity. There's a very large capacity for chemical assay analysis in different -- in blood and biological media and also some environmental media.

And I didn't really check. I mean, when this question came up, we basically started calling our analytical chemist friends and ask them how is this -- you know, how are these ethers -- this class of ethers, how are they measured?

But I thought one thing that would be useful for the public and other researchers, if it's not done, is just to have a catalogue of the assays available that can be done, just so people in public meetings will ask these questions about, well, can we measure that, do we know how to measure chemical acts in blood, urine, et cetera? And just having a quick resource, because it's there. I know -- I mean, I know you internally probably have, what is it, 16 chemical classes, thousands of assays available.

And I don't know if it's there, but if it's on a website, it's like what can be done California, what can be measured would be a neat resource on top of all of the results that come out of it.

DR. DiBARTOLOMEIS: I'll just really quickly

respond. First of all, thank you for that comment, and it is something that we've talked about internally about maybe doing more marketing of the Program, if I may use that word, of getting this information of what we -- are capable of doing out to a broader public besides just on our website, but we don't have any specific ideas, other than we've talked about it a lot. So your comment gets us to kind of rethink that.

Let me just ask you this, you know, what's on the website now with respect to what we can do, do you think that that's not really answering the question that you -- you know, or solving the problem or --

PANEL MEMBER McKONE: No, I actually haven't looked at it.

(Laughter.)

DR. DiBARTOLOMEIS: Because we do list what we're capable of doing on the website, but it is -- it's only accessible if you go onto the website.

PANEL MEMBER McKONE: Right, so -- and I -- well, I was thinking it's on the website, but also making this -- I mean, it occurred to me now what a great resource. But I was in another hearing, in another context, and it was like we should have checked. I mean, it doesn't get around to other State agencies that -- and, you know, it's probably a broader problem than just

biomonitoring, but here's a world class, you know, capability.

And I don't think it's a public service like you're marketing the analysis, but just making clear that if somebody raises the question can we do it, this is the place that we know we can do it. That's kind of a --

DR. DiBARTOLOMEIS: Well, thank you for the comment. We'll certainly consider it.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: I have a few questions and comments. And I think there was a lot of information presented today, and it was all very exciting, and really underscores just the success and progress of the Program.

One question I had for Dr. DiBartolomeis, it seems like the new CDC funding -- one, I want to commend the Program for getting refunded, especially given cutbacks in federal funding for research and environmental health in general.

I think that really is a sign of real praise for the work that has been done, and I'm sure the work that will be done. It looks like they put in a requirement that you focus on statewide biomonitoring surveillance as part of the new funding. And maybe today, and maybe you can comment a little bit more about some of the directions you might go in to attain that. I know that's been a

focus of the legislation and it's been something that the Panel and the Program has wanted. It was mentioned in the evaluation. And now with less funding, there may be a requirement that you develop more of that. So maybe you can comment on that.

DR. DiBARTOLOMEIS: So two quick comments. One is a requirement might be a strong word, but the focus of these grants was not on methods development, it was on data generation, so -- and part of that would be representative -- you know, data from representative population sampling.

So one way we're addressing that is with these archive samples with the Genetic Disease Screening Program. And if this is successful -- we call our first 600, you know, like kind of pilot. If this is successful, that's a sustaining way of getting not quite a random representation of the public, but certainly to continue to add to that database.

And then, of course, our priority setting scheme, you know, that we're developing, we're considering, you know, other options as well. So hopefully, I'll give you more detail on that at a future meeting, if that's okay.

PANEL MEMBER BRADMAN: Right. Okay.

Another thought I had, and maybe there needs to be some more discussion and response to Ms. Arnesen's

presentation, but the idea of a different kind of advisory body that involves stakeholders beyond just the Panel, I think there would have to be a lot of discussion about how that would be organized. But I think that's a really interesting idea and could also invigorate both public and industry and other kinds of involvement in the Program, and perhaps really kind of help generate a lot of, you know, excitement and support going forward. So that's something that I thought was an interesting idea, and maybe warrants a lot more discussion.

And finally, it seems to me that one thing that could benefit the Program is some press about the work that's being done. Rather than being project specific or study specific, you know, press release on some finding, it seems to me there could be a need for some, you know, feature type article about, you know, people are very concerned about the environment. They're concerned about exposures. Well, who's doing the work and what's out there? And not a piece on necessarily on policy or this is good or this is bad, but just what the State is doing? It seem to me there's some real opportunities there for some balanced, you know, public presentation of this in the larger media.

MS. ARNESEN: There were actually several recommendations that the Program kind of developed a

targeted campaign by using stories or vignettes about Program successes that could then be targeted to specific audiences. I think it's a little -- it's along the same line. It's not about, like, a particular method or, you know, particular study. It's kind of more going to the heart of the what the Program is doing.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: Hi. This comment follows up on the publicizing capacity comment made earlier. And I was looking at the National Institute of Health funded grant website recently, especially grants funded by the National Institute of Environmental Health Sciences, and I was struck by how there are researchers in California with funded NIH grants doing biological monitoring for the contaminants that are measured by these laboratories represented here, that are actually sending those samples to other places, including the CDC. And I'm just wondering if it would be a good idea to reach out to those people and find out was it a lack of knowledge that they weren't approaching this group here in California or was it other reasons, because that just struck me, when I was looking at these grants, that it should be analyzed by the State of California since we have such excellent capacity.

DR. DiBARTOLOMEIS: Well, I guess my only comment now is, well, thanks for that information, and we'll have

to huddle and figure out, you know, what we can do. Sometimes there's a collaboration that's well in advance, and it would be kind of awkward for us to try to insert ourselves, but we can certainly look into that. Thanks for the info.

CHAIRPERSON LUDERER: Dr. Alexeeff.

DIRECTOR ALEXEEFF: Yeah. I wanted to thank Christine Arnesen for that presentation. It also reminded me, last week I was at a conference in San Diego, and I was asked about Proposition 65, how do we know it's actually doing anything for public health?

And so I really liked your example, because it reminded me that for both flame retardants and lead, those have been major activities with regard to Prop 65, in terms of identifying them as chemicals of concern, and then a lot of actions being taken to reduce the exposures in lots of different types of products and scenarios.

So I think that is a demonstration of a lot of, well, Prop 65, as well as probably some other laws working to reduce exposures in Californians.

So thanks.

CHAIRPERSON LUDERER: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Thanks. I just had a brief question actually about the collaboration with the Genetic Disease Screening Program. And is that

collaboration mainly about obtaining samples or is there a connection between -- is there any other data level connection being made in that program?

DR. DiBARTOLOMEIS: Right now, it's just about getting the samples.

PANEL MEMBER SCHWARZMAN: Okay. So it's a rich source.

DR. DiBARTOLOMEIS: I don't think -- there is no other link yet, but we've actually explored possibilities, and we are still -- we have our mind open to that, but right now it's just getting the samples.

PANEL MEMBER SCHWARZMAN: Thanks.

CHAIRPERSON LUDERER: All right. Now, I think we'll take some public comments, and then we'll have time for additional Panel discussion after that. Do we have any public comments?

MS. DUNN: We do not.

CHAIRPERSON LUDERER: Okay. Great. So we do have time for more Panel discussion. Any other questions or comments from Panel members?

MS. DUNN: We do have a public comment.

CHAIRPERSON LUDERER: Oh, okay. Great.

MS. PATTON: Hi. My name is Sharyle Patton. I'm Director of the Commonweal Biomonitoring Resource Center. And really wanted to applaud the work of Biomonitoring

California Program and the work of the Science Guidance Panel. Really set the benchmark for this kind of activity on the State level and for -- actually at other levels as well about doing good biomonitoring work.

So thank you very much for what you've been doing. And, of course, I'm really excited to hear that you're considering the establishment of an advisory group that would bring in stakeholders. I think that could be a way to raise awareness about what's going on about biomonitoring and what the significance is, and help citizens understand the advantages of what you can know about chemical body burden levels and what you can't know. That's all very important, so I'm excited about that.

But I'm here today to make a request about VOCs. And I'd like to read a short letter I've written, and I'll give Amy copies of these for all of you. And we would like to request the Science Guidance Panel to recommend the prioritizing of VOCs within the list of chemicals of concern under consideration for exposure monitoring by the Biomonitoring California Program.

We do understand the limitations of Biomonitoring California activities due to funding constraints, but we consider VOCs to be of sufficient concern for greater consideration, given the number of likely exposure pathways experienced by Californians and the number of

well-documented linkages between VOCs and disease.

VOCs, organic -- Volatile Organic Compounds, or VOCs, is the name given to substances that contain carbon and that evaporate (become a vapor) or off-gasses at room temperature. Examples include, and I'm sure you're all aware of this, benzene, methylene, chloride, hexane, toluene, styrene, heptane, and perchloroethylene.

VOCs are widely used in household and commercial products. Some cleaners, disinfectants, waxes, glues, cosmetics, dry-cleaning products, paints, varnishes and preservatives include VOCs, as well as gasoline, kerosene, and other fuels. VOCs are found in cigarette smoke and pesticides. A number of building and household materials may be sources of VOCs. New carpeting, backing and adhesives; draperies; wood products that use certain glues, finishes and waxes in the manufacturing process; and vinyl type flooring and wall coverings all may release VOCs into the air. They've also been detected at elevated levels around gas production sites, including unconventional natural gas production activities.

The ability of VOCs to cause health effects varies greatly. As with other chemicals, the effects of VOC exposure depends on several factors, including the type of VOC, the amount of VOC, and the length of time a person is exposed. Exposures to elevated levels of VOCs

may cause irritation to the eyes, nose, throat. Headaches, nausea, and nerve problems can also occur.

A study of animals has shown that breathing some types of VOCs over a long period of time could increase the risk of cancer.

Of special concern are exposures to workers in gas production activities. A recent NIOSH study indicates that some workers are exposed well beyond safety standards to benzene, a chemical closely linked to leukemia.

Most Californians are exposed daily to mixtures of VOCs. Measuring levels of VOCs in Californians will help guide public health policies in limiting exposures. Having the capacity to compare average levels of exposures for most Californians to levels found in populations clustered around gas production activities will be critically important in ensuring such activities are appropriately regulated to ensure safety.

We ask you to recommend prioritizing VOCs as chemicals of great concern to California citizens to the Biomonitoring California Program, and request that you support the Program in developing the appropriate assays for detection and measurement in appropriate human biospecimens, which I believe in this case would be mostly urine, and in moving forward to measure levels of these chemicals in Californians as soon as possible.

We request that you recommend particular urgency in moving forward in testing populations living near sites that are currently, or will in the future, be developed for the purposes of gas and oil extraction.

So thank you very much for your consideration. And thank you again for all you work that you do. Again, I'm Sharyle Patton from the Commonweal Biomonitoring Resource Center.

I'll give copies of these letters to Amy.

I've broken your microphone already. Have you noticed this?

CHAIRPERSON LUDERER: Thank you very much for those comments. I think you're aware that the -- a limited number of VOCs are already designated chemicals under the Biomonitoring California Program.

MS. PATTON: Yes, and we're hoping you'll move those up.

CHAIRPERSON LUDERER: Thank you very much.

MS. PATTON: Yes.

CHAIRPERSON LUDERER: Any additional comments or questions from Panel members?

Okay. Thank you very much

MS. PATTON: Thank you.

CHAIRPERSON LUDERER: Okay. We're going to then move on to the Laboratory Updates. So I'd like to

introduce Dr. Jianwen She, Chief of the Biochemistry Section of the Environmental Health Laboratory Branch in the California Department of Public Health, and Dr. Myrto Petreas, Chief of the Environmental Chemistry Branch, in the Environmental Chemistry Laboratory, in the Department of Toxic Substances Control.

So Dr. She and Dr. Petreas will provide updates on the laboratories.

Dr. She.

(Thereupon an overhead presentation was presented as follows.)

DR. SHE: Give me second.

Thank you, Dr. Luderer. And good morning and welcome, members of the Panel and audience. Today, I will provide an update for EHL. This includes some recent staff changes, analytical method developments, project sample analysis status, and finally our future work.

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DR. SHE: As you may know, due to the reduction of the CDC funds, our analysts at EHL reduced from five to two. All of the core laboratory staff reduced from three to zero.

Another bad news is that Dr. Simon Ip left us for promotion in a different State program. Dr. Ip was responsible for PAH analysis and also provided training to

new staff; conducted data analysis for us. With all this bad news, I'd still like to take the opportunity to thank all of the staff including Dr. Ip, Shirley Cao, John Chen, XiRui Wang, Long Nguyen(Nu-Gen) -- Nguyen(Nu-jeen), Alanna Viegas, Dr. Indranil Sen, and Yu Chen Chang for their outstanding contribution to the Program. I wish them well for their new career.

With the departure of so many experienced staff, laboratory faced serious challenge in managing many routine tasks, including biorepository management, laboratory information management, quality control/quality assurance. And also we needed to drop some analytes from analytical -- analyte panel, which we already developed.

We have the opportunity to fill two positions, which one is left by Dr. Ip and then another one is two-year limited term.

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DR. SHE: However, laboratory is still working to finish a few new methods. One is the OP flame retardants. We are able to work out the MS/MS and HPLC separation method. And now, we are in the final stage to complete sample clean-up procedure.

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DR. SHE: For your information, here are the four compounds we are working on. You can see from the

structure, they are similar to the DAPs, and hope our DAPs experience can help with the method development. And maybe we even can bundle this method with DAP methods, which we dropped before.

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DR. SHE: Here is a quick -- is snapshot of a chromatogram we did for four compounds. You can see we have very well separation and the MS method is working. We expect we will finish this method in next one to two months.

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DR. SHE: Second method we are undertaking, and intend to complete in next one to two months, is BPA analogues. Again, this slide I show before is five compounds, including BPA itself we are working on.

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DR. SHE: In the last few months, as I mentioned before, for this method it presents us extra challenges, especially contamination, because this parent compound we work on in our laboratory everywhere we have some residues from environmental we work in. So we needed to redevelop our method. Now, we use online systems, which is a closed system, suffering less contamination issues.

At the same time, according to literature, the expected levels of this chemical in the human body are not

high. So we need to push down our detection limit to 0.1, which are -- which we already achieved. Again, the method should be finished in the next one to two months.

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DR. SHE: Another major undertaking we're doing is to do the unknown screening. For the unknown screening, the laboratory have a machine, which is funded by CDPH. We called it Exactive Plus. But to do certain things, this machine cannot do, so department -- we are very -- very lucky and thankful to CDPH, they give us another $250(sic) at the end of the fiscal year, to allow us to upgrade this machine from Exactive Plus to Q-Exactive Plus. We are looking forward to the installation this month or next month.

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DR. SHE: With this upgrading, we hope we can do certain more experiment with the new machine. For example, with Exactive Plus, we can do accurate mass measurement, but to do unknown screening, certain things, certain information will help us to make the tasks easier. For example, we can do data-dependent mass spectrometer -- mass spectra. And we also can do data independent acquisition, plus all ion fragmentations. Especially, the first two types of analysis is very important for us to provide a different dimension -- dimensional information

to verify the structure. So I look forward to learning new things to take advantage of this upgrade.

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DR. SHE: This slide -- this training slide I use to train the other staff for the unknown screening for the different audience, so that's different background. Sorry about that.

The slide shows some potential application of unknown screening, and also its limitation. For example, we are doing targeted analysis at this moment, that's number one. When you go down, we like to do the metabolite profiling, which includes more analytes. I use our biomonitoring priority chemicals, maybe target analysis corresponded to our priority chemicals. Metabolite profiling corresponded to our designated chemical, plus the metabolite from chemical. We already know the parents.

We also like to increase our capability to do the full metabolomics which includes all of the metabolites. If we reach that capability, we can do metabolomic fingerprint. For example, we conduct the HERMOSA study with UC Berkeley. We're able to test the difference before the intervention and after intervention. But if we can do metabolomics we can test the sample's difference. Not target a few phthalates, phenols, we can see all of

the comprehensive changes before the intervention and after intervention, because some chemicals we're never looking for, now we can look.

However, unknown screening has its limitation. You can see that triangle on the left side. We increase the scope when we do more analyte. That's a benefit of unknown screening. On the right side, you may lose the accuracy, because now you target much more. Also, you may suffer some sensitivity loss. That's -- that's a certain limitation. Of course, there are possible more limitations, like you make a few more times to do it.

Also, the restriction, ethical review IRB review. I tried to propose IRB, which not passed the last time. We will try again, so we also look for the Panel's input of how to resolve these issues.

Also, we may have false positives. That's a technical issue too.

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DR. SHE: I show three types of the unknown screening for application on the metabolomics. Corresponding, to these three types, technically we can't take a different approach. So, for example, the first one targeted analysis, we already done. We know the chemical structure. We have a standard. We know the retention times, so we can give exactly how much and that chemical

can be identified exactly too.

For second type, we may look for our designated chemicals. So also we may know the parents of a certain chemical. We look for their metabolite. So chemical structure we may already know, but we do not have standard. We have no retention times. So for these two different things, we build probability based chemical libraries. We also build designated chemicals libraries.

As I mentioned before, we build the Toxic Chemical Finder library, which was based on Derek Muir's publication in the ES&T. So right now we are -- on the third row, these are chemicals that we do not know the structure. We do not know -- we do not have standards. So basically we have not any information.

So we based it on the library search, certain statistical analysis, conducted data mining, or check the ChemSpider to find chemicals -- possibility the chemical is in the environment and in human bodies, plus a lot of other thing we need to learn.

So anyway, at this moment, we are -- use our strategy to test the first group of chemicals to see can we see this chemical we already know? We already have a method. Can we see them with a new machine at what levels? So I hope I can report the result next time.

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DR. SHE: This slide I showed last time about our analysis status. So in the last three months, we're able to finish all of the analytes for the laboratory analysis. All of the samples still under the -- data still under review. So we hope to report it to the Program very soon.

Unfortunately, with the staff reduction, we lost some capability. For example, a perchlorate analysis, and also the arsenic speciation. Laboratory is struggling. It is a challenge for laboratory. Try to cross training staff to make this happening. I cannot predict when we'll get it done, at this moment.

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DR. SHE: Another activity we are undertaking is the CDC's proficiency test. Every year, we have received it three times, CDC proficiency test samples. This time we received four groups of chemicals, include phthalate, PAH --

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DR. SHE: -- environmental phenol, universal pesticides. So laboratory expected to finish all of this in next -- next Monday, and report it to the CDC in the week after.

In the past, our laboratory able to successfully pass the CDC PT test. The success rate is about 97 percent. So for each test we have two samples, a low

level and a high level. So the test we conducted is a list times by two.

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DR. SHE: Dr. D. already mentioned about publications. The first one we submitted to EHP about the high levels of the BP-3 in the firefighter urine samples. I did not receive anything from the EHP yet. And usually EHP reviews submission on Wednesday, which we did not receive anything today, so I still hope that's good news. EHP generally does not publish occupation studies. That's what their policy, but we still keep our hope they can accept our submission.

For the laboratory methods, we submitted two papers, the validation of a simple and robust method for arsenic speciation in human urine using HPLC-ICP-MS to the Journal of AOAC International. It's under review now.

And another method -- actually, this is kind of a VOC method, is we look for the metabolite for benzene and toluene. So this method is under -- actually, in press Analytical Method.

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DR. SHE: For the future, we'd like to complete all of the three methods I mentioned. And also collaboration with the Kaiser Permanente of Northern California to do the environmental phenol analysis for

1,800 samples. It may give us opportunity to generate and expand our database at the same time to solve some -- temporarily to solve some of staff shortage issues. Of course, we will finish GDSP samples assigned to us.

Thank you.

CHAIRPERSON LUDERER: Thank you very much, Dr. She. We have time now for some clarifying questions from Panel members.

Dr. Fiehn.

PANEL MEMBER FIEHN: Thank you for your informative report. That's very exciting to see that you follow the path of untargeted analyses and I fully support that.

I do have, however, a question if you could elaborate on the problems you said that you have for HPLC developments for OP flame retardants methods. I see that you have these, you know, chromatograms established, but you know, is there -- what are other problems?

DR. SHE: One quick problem is right now the machine is down. That's a very common problem, so we are trying to resolve it.

And the other part of the problem, for example, this standard is 25 ppb. So the flame retardant is very low levels. This OP, according to the paper published by the University of Boston, and other study from Duke

University, look like the levels are extremely low. So we -- I assume or predict we may have a challenge on the sensitivity part, if we cannot push down this to the ppt levels.

PANEL MEMBER FIEHN: But I assume you use classic, you know, SPE or anything like that for removing matrix effects and to enrich these compounds?

DR. SHE: Yes, we are. We are using -- we try different SPE, online SPE and offline SPE to remove the interference and then also enrich the analytes.

PANEL MEMBER FIEHN: And you have conducted spike experiment with these compounds to -- you know, to see if you are in that range of sensitivity?

DR. SHE: You know, I -- because the machine was down, we have the standard. We checked. We checked, but we didn't establish linearity. So strictly speaking, we don't have that data yet.

PANEL MEMBER FIEHN: So what are the measures you take to improve the uptime of the machines?

DR. SHE: Measure to take -- to maintain the machines uprun times, for example, we try to PM, preventive maintenance, is one of the key issues. We needed to do that more frequently. Limited by funds, sometimes we have a gap in our preventive maintenance plan, also in-house training of the people,

troubleshooting and maintenance experience very well document the machine's operation condition may be the way to improve the machine's run times to prevent the breakdown of the machine.

PANEL MEMBER FIEHN: Okay. Thank you.

DR. SHE: Is there any suggestion you have for us?

PANEL MEMBER FIEHN: Yeah, we can talk about it at the break.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: I just had a quick comment, also related to the OP flame retardants, but not so much about method. I just think -- I want to say it's -- I think it's really important to develop methods for these compounds given our history in California of relatively high exposures to flame retardants as documented by PBDEs.

The other piece of this though is that, you know, for example we looked at flame retardants in child care facilities and found OP flame retardants in all the facilities. And it would be great if, in the future, we can do some analyses focusing on kids as well, especially young kids. I know a lot of the targets for the Program in general have been adult populations, and, you know, many of us I think know in this, we've worked on

children's environmental health for a long time, that children are often more highly exposed. And I think this would be a particular case where it would be interesting to generate some data across the age spectrum, when the method is up and running.

DR. SHE: That's a very good comment. Young children are not little adults, as we know. And then especially for PBDE, people notice different levels in the kids, and then -- so I expect the flame retardants exposure to the kids may be different than adult. So that's something we really appreciate, and that we may need to consider samples for kids.

CHAIRPERSON LUDERER: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Thanks. Forgive me if this is not targeted correctly at the lab staff, but because you addressed the methods development for looking at unknowns, it's very intriguing to me that the Program might be -- might develop methods for doing this sort of unknown screening. And I'm curious to hear a little bit more about plans for what types of samples, and sort of numbers or populations you're thinking about screening with these techniques?

That is, I get the sense that it -- so it's -- instead of doing targeted screening, it's looking for things that we don't know to look for. And I'm intrigued

who the sample population might be in mind for that.

DR. SHE: That part -- well, I'm not sure at least myself not -- we have planned that far away. We are right now thinking at least getting some kind of IRB approval, we can use anonymous sample to conduct -- to test the strategy we are developing, and then see the reality and the feasibility of how we can use these new tools to do it. Once we pass that stage, we may consider what kind of study we can do.

PANEL MEMBER SCHWARZMAN: So you're sort of still in methods development?

DR. SHE: Yes, still in the method development, and the IRB approval for the tests that we do with unknown screening -- anonymous samples.

PANEL MEMBER SCHWARZMAN: And maybe that's a conversation to follow? Thanks.

DR. SHE: Yes, definitely we like to follow up.

CHAIRPERSON LUDERER: Actually, I just wanted to follow up on that with a clarification. You mentioned that there -- you were having difficulty getting IRB approval. So do you have approval for anonymized samples now or you're still working on that?

DR. SHE: We don't have -- we submitted to IRB maybe a little bit more complex than we needed or we do not have the prepared well, because we try to catch

deadline. And then also, because, sure this issue was brought up early enough for the Program, so that gave us some comment. For example, with analytes they provide -- we list a few chemical groups that said now you need to give us a list of specific chemicals you're looking for. So that's a paradox there.

We one side we said unknown, we side we said okay specific list. So we end up to decide to provide a list of TCF, Toxic Chemical Finder. This all our 600 chemical we've been looking for, but we're also looking for the Panel's input of how to resolve this paradox.

CHAIRPERSON LUDERER: Okay. I think maybe we'll have some more discussion about that among the Panel members during the discussion time, but thank you very much, Dr. She.

And I'd like to introduce again Dr. Petreas who's going to be giving us an update on the Environmental Chemistry Laboratory.

(Thereupon an overhead presentation was presented as follows.)

DR. PETREAS: Thank you. Good morning. So it's my turn to give you an update on what's happening at the Department of Toxic Substances Control Lab.

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DR. PETREAS: And I'll start with the -- where we

are with staffing, where we are with sample analysis, and also where we are with identifying so-called unknowns. And as usual, I'll add some other activities that we do for our Department, which may directly or indirectly benefit the Program.

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DR. PETREAS: So in terms of staffing, we're fortunate to have retained our two State funded staff from the beginning. So Dr. Miaomiao Wang and Yunzhu Wang have Been with us from the beginning of the Program. Also, with the CDC cooperative agreement, we had four positions. We also lost two. So Dr. Harwani and Dr. Guo have gone, but we still have with us Dr. Houtz and Dr. Crispo-Smith. Now, because Sabrina Crispo-Smith is on maternity leave, we were able to keep Dr. Shirley Cao who was our QA officer for the Program to be with us for a short time until Sabrina comes back this month basically.

Incidentally, I guess this is a very productive group in a different way too, because three of the four women have gone on maternity leave in the last two years, but we're still producing.

(Laughter.)

DR. PETREAS: So we feel okay with that. So Sabrina is coming back this month.

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DR. PETREAS: We also had funding for two limited term positions for two years. These are State funds. And we're able to attract two of our own DTSC staff to transfer to these positions with a lot of experience. So Arthur Holden has a lot of experience with high resolution mass spectrometry, and a lot of work with POPs analysis. So he'll continue working on that. And Martin Snider has experience with liquid chromatography. And he'll be working on our PFC part of the project. And he also has been our laboratory's contact with the Safer Consumer Products team. So he really brings a good combination of skills, and with a link between the lab and the Safer Consumer Products.

And I also want to mention here Dr. Park -- I want to acknowledge Dr. June-Soo Park who's really managing the whole team here. And also, by the way, Dr. Quinn who is visiting here to see -- he's our newer appointed Branch Chief. He's in our analytical branch. So he's my colleague here and he came to see what we're doing and talk more about what we can do.

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DR. PETREAS: So with that, talk about the progress with the analysis. We have two major studies and we continue analyzing samples for the Teachers Study, which is the biggest study we have. So it's ongoing. We

continue to receive samples and we process them as they come. And we're also working on the Expanded BEST. We have completed the PFC part, and we're now working on the POPs with these studies.

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DR. PETREAS: And for more detail, as of the beginning of this month, as I said, we have completed all of the PFCs, and the data have been released to the Program. And we have aliquoted all the samples from -- for the POPs. And we're slowly moving through the different steps of extraction and instrument analysis and so forth. So we're on schedule, we're on time, and we're okay with that.

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DR. PETREAS: Now our biggest study is the Teachers Study. And again, as of this month, we have received close to 2,500 samples. And we have aliquoted about 2,000 of them. This is a major endeavor to do the aliquoting, because we're sending samples for lipids analysis and thyroid hormone analysis separately, and then we move down these tracks of analysis for PFCs, for PBDEs, and the PCBs and OCPs in a different track. And so we're able to release data to the principal investigator for 1,300 PFCs and almost 1,300 PBDEs. We're behind on the PCB, OCP because of instrument limitation. We have to

work either on the PBDE mode or the PCB mode, different columns. So we put emphasis on the PBDEs because of deadlines and publications coming with that.

So I also have some data some results. Just to remind you, these are female teachers. It's a cohort that was started back in the nineties. And the interesting thing is this is a very -- it's an older women's group. If you see the age -- if I can show here. Yeah, in this table -- yeah. So in this table you can see the median age around 65 or so. So this is an older group up to 99 years old.

It's mostly white, so it's not really representative, but we have so many subjects in the study. And this allows us to do a lot of -- get a lot of information from the demographics, from the questionnaires. Primarily, this is a breast cancer study, so it's a case control study. We're not talking about that yet. But just looking at the controls, and the questionnaires we have -- we're able to see predictors of exposures to different chemicals. And as I said, this is ongoing, so there will be more to come.

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DR. PETREAS: Now, the results of the -- I'm now showing just PFCs here. These are the list of PFCs we're doing, the 12 PFCs, geometric means and percentiles. And

I guess it's a little busy to see. What I did here is I'm showing you the geometric means we have compared to the very recently released update of NHANES. So it's 2011-12 NHANES. And this, thanks to our colleagues in EHIB, these are for -- out of these NHANES numbers, we looked only at women over 40 years old. And there were about 500 of those from NHANES. So comparing these to our 1,300, we find some interesting -- I don't know if it's clear for you to see, but in red -- did I do this?

Oops. Sorry.

So in red font, I have the PFOA and the PFHxS, the hexasulfonate that are really much higher in our group, than they are in the NHANES. I mean, this is not a statistical comparison, but it's quite glaring to show that these group of women, California women, have something which makes them have higher levels of the PFCs. And we know PFCs are dropping overall, at least the PFOA and the ones we're showing here. So it's interesting, and we're waiting for more data from the study to have more power to look at why.

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DR. PETREAS: Okay. So in terms of our task of identifying unknowns, we have an instrument that we bought from the CDC grant. It's an Agilent. By September, we completed the installation and testing. And training is

underway. First of all from the vendor, Agilent, was giving training in-house. Dr. Park attended the UC Davis two-week program training, Dr. Fiehn's lab. So that's pretty good. And also, staff would be attending some software training by Agilent in San Diego.

And it will give us an opportunity to plan to visit San Diego State University and meet with staff there and who are working on similar things. So we tried to network and get more information and more expertise here.

Of course, we have our cross-lab TOF what we -- as we call it, or unknown group. And we coordinate work with our toxicologists and chemists. So at this stage, we're at only the beginning, so we're building libraries.

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DR. PETREAS: And specifically, we also use the Howard and Muir three publications from ES&T over the different chemicals in commerce. And they more recently released in Food and Chemical Toxicology Journal, Goldsmith, on the chemicals in consumer products that the EPA compiles. And this database was given to us after modification by Dr. Young from UC Davis.

So we're building the libraries. We also have the library that the vendor gave us on pesticides. And we're building our own library with retention times and standards for the chemicals that we currently are doing,

and we have standards and methods for. So more to come with that, and we'll be talking with our sister lab, of course.

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DR. PETREAS: Now, in terms of other activities, we have been measuring those 12 PFCs that NHANES does. And they are the perfluorocarboxylic acids, like PFOA, or the sulfonic acids like PFOS. These are the major representatives of these groups. But it seems -- this is like only a partial picture of the fluorinated compounds of interest.

There are more compounds that people are measuring and reporting. And they require new nomenclature. And the way these are used, it's PFAS, perfluoroalkyl and polyfluoroalkyl substances. So we'll be -- we'll start using this naming. And we want to define more classes. So just to explain perfluorinated, which means fully fluorinated, there are no hydrogen in the carbon atom, usually from four to 12 carbon chains. And these are all the PFCs that we have been monitoring.

Now, polyfluoroalkyl molecules, they're not completely fluorinated, so they have some carbon hydrogen bonds. And the interesting of those is that they can transform. So they be can precursors to the perfluoro through biotic or abiotic processes. So there are

additional chemicals that people are starting to look at.

Also, the polyfluoroalkyl phosphates or PAPs, diPAPs, triPAPs, are phosphate esters with one or more perfluorinated groups.

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DR. PETREAS: So we started looking at these compounds. And I guess the reason -- if you remember, this is a chart I showed you in the previous meeting. And it shows -- this is from our Three Generations Study. And I showed the difference between some of the PFC chemicals found in mothers and daughters to show how new chemicals introduced in the market get reflected in what we have in our bodies. So we see transition chemicals that were not measured in the mothers are measured now in the daughters, and vice versa.

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DR. PETREAS: So again, this is again from our work -- work we published a few years ago showing trends of PFOS, PFOA, and other PFCs. And we had archived samples before NHANES started measuring. So we concur with NHANES in terms of the decline of PFOS and PFOA, but we had also seen the rise of PFOA. So we know things are going down or changing.

From a different research group, this is again blood from U.S. population. It's a little too dark here,

but the small slice that's extending out, about four percent of the total, are these polyfluorinated precursors. The majority of what I'm showing here is the PFOA, PFOS, and the other compounds that we are measuring.

So it's still a small, like four percent of the total, of the fluorinated compounds. But we believe this slice is worth studying, number one, because the overall pie is getting smaller, getting less exposure than the traditional ones, but more and more of the newer ones, so we need to be monitoring those, and we are.

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DR. PETREAS: So we'll have more information and discussion at the later -- in a different meeting for possible addition to the designated list, because these chemicals are not designated yet. And so we need to work with our toxicologists, chemists and present you something later.

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DR. PETREAS: Okay. So an update on our Pregnant Women Study from San Francisco General Hospital. This is the third wave of these studies. This time we're looking to PBDEs and hydroxy-BDES in serum of women undergoing abortions, second trimester pregnancy terminations. So we have access to the serum of the women, and also placenta and fetal liver.

So recruitment is underway. We already have received the 50 samples that were supposed to come to our lab this year, and there's another 130 that will be recruited and collected next year. And we already have started the analysis of the ones we have.

The interesting thing of these studies is that it's a long collaboration we have with UCSF. And the demographics are the same as with the previous studies we had from 2008 and '09 and 2011-12. These were the ones that allowed us to show the fall -- the drop of PBDEs between these two time periods. So we can use this third phase to continue determining temporal trends, but also we can see now the distribution of these chemicals between or among the mother and in the placenta the and fetal liver. So this is funded by NIHS, and we're collaborating the Tracey Woodruff who's the PI.

Yes. And also the aggregate results will be shared with Biomonitoring California. The same thing we do with the Teachers Study, which is funded externally, but can feed data to the -- to our program.

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DR. PETREAS: Okay. Switching now to dust. We measure contaminants in dust. And this helps support our Department's Safer Consumer Products, because dust is really the link between chemicals in the products and in

our bodies, and they complement the biomonitoring measurements.

In fact, we found that dust measurements can really predict exposures. We have a publication in press from our leukemia study that we did with UC Berkeley, where PBDEs in women's serum in residential dust were correlated. So by measuring the dust in the house, the mothers of the leukemia children levels were -- could be predicted by the dust, and this is coming up.

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DR. PETREAS: Now, also the methods -- so we have completed methods and analyzed the dust from houses and fire stations. And we can measure PBDEs, Firemaster, and other brominated flame retardants, and also the PAHs, PCBs, and pesticides. Now, we're happy to say that we have methods to measure brominated and chlorinated dioxins and furans. And also the phosphorus based flame retardants including the TDCPP and TCEP which are on Prop 65. And also TDCPP is one of our Safer Consumer Products chemicals chosen.

And the next phase of analysis will focus on the PFASs and precursors - I'm using this new nomenclature - and also the phenolics, the BPA, triclosan, and others. And also, we want to look -- I mean, of course, this is a great matrix to look at unknowns.

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DR. PETREAS: Just to show you that from the phosphorus flame retardants that we measure in dust and we use GC-MS/MS. This is the list. It encompasses a lot of critical ingredients of many commercial mixtures. And to the right, I have a column of the corresponding metabolites that we're working to -- we're analyzing in urine using LC-MS/MS. Again, this is work we do for our Safer Consumer Products, so it's good to know that we can have a metabolite matching some of the major flame retardants that we can find in products and in dust.

I think this is where I stop. Thank you.

CHAIRPERSON LUDERER: Thank you very much, Dr. Petreas. It's really exciting to see the progress both labs are making on the methods for identifying unknowns. And I was also very interested in the linkages that your -- through the dust measurements you're able to make now between the biomonitored chemicals and potential routes of exposure to those chemicals.

We have time now for some questions from Panel members regarding the last presentation. And then we can take some public comments, and then we'll have more time for discussion. Any questions for Dr. Petreas?

Dr. Bradman.

PANEL MEMBER BRADMAN: I feel like I should have

should some questions, but I really just thought this presentation was, you know, interesting and fascinating, and it seems like you've made a lot of progress in really addressing some of the key priority compounds that we've talked about and look forward to seeing some of the data that comes out of this.

So great work.

DR. PETREAS: Thank you.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: Hi. I had a question about your unknowns libraries, because you had listed some of the libraries that you were going to look at here in the slide show, but I believe there are others commercial unknown libraries available. Is there -- do you feel like there will be funding identified to maybe grow these unknown libraries beyond building your own and the ones listed here?

DR. PETREAS: We are in the beginning, so we -- we built our own based on what standards we have in-house and we have retention times, so that was a no-brainer. We got something that the vendor gave us, but we also got libraries that somebody else had already weeded through and modified. And we're offered to get anything we can, yeah. So at this point, we're really open to all suggestions. And we're working with our other

lab too. We have different instruments, so different instruments require different libraries and software, but, yes, we're open.

CHAIRPERSON LUDERER: Okay. I actually had another question, just a quick question for Dr. She, which was about you mentioned in I think your last slide about future directions, Kaiser Northern California population. And I assume that's not the same population that's being study in BEST. And I was wondering if you could say something more about that.

DR. SHE: Yes. That's 1,800 samples from the Kaiser conducted study for the pregnant women have gestational diabetes all under the control groups, so they're looking for the environmental phenols, and plus two other chemicals, BP-3 and triclosan. They are interested in it. They have -- I don't know. They have an external fund to support the analysis. And then also, after we do it, they may be interested in the new BPA analog we are working on. So that's a brief introduction.

CHAIRPERSON LUDERER: Great. Thank you. Sounds like an exciting opportunity.

Do we have any public comments?

MS. DUNN: We do not.

CHAIRPERSON LUDERER: We do not.

All right. Well, then we have time to move --

sorry. I just turned off my microphone. We have time for Panel discussion about both presentations.

Dr. Bradman.

PANEL MEMBER BRADMAN: Hi. Well, I'll just take this public comment period to just also respond to the comments by Sharyle Patton on VOCs. I felt like there was kind of a dead silence after that. And I had to spend a little time thinking. One, just really appreciate your attention to those compounds, and thank you for bringing that up. And also to say that, you know, we have examined some as part of the Biomonitoring Program, and also to note that the Air Resources Board has been funding some work over the years on VOCs in, for example, child care, schools, and new homes in California. And that could be a resource to evaluate what compounds we might want to prioritize or think about in terms of biomonitoring.

Of course, sometimes monitoring for VOCs can be challenging, because they're relatively transient, and there might be a balance there between the best way to understand exposure, in terms of, you know, short-term exposures and the difficulties with that, and where environmental monitoring may provide some advantages too.

But there's definitely some data out there. In our work in child care, we have identified some, where on at least on a risk basis, they're higher than we'd want

them to be. Certainly formaldehyde exceeded California standards, 8-hour standards. And then others on a cancer basis, we would have some concerns about. So there is some information out there that might help, you know, decision making as we go forward.

CHAIRPERSON LUDERER: Any other comments or questions from Panel members about the laboratory updates?

All right. Were there any particular questions that the Program staff would like us to address about laboratory work ongoing, or have we have -- have those come up in our questions already?

Dr. She.

DR. SHE: Any suggestions on how to proceed with the IRB on the unknown screening?

CHAIRPERSON LUDERER: So the question is whether we have any suggestions about how to proceed with the IRB? And can you just confirm, so the problem has been that you were proposing de-identified samples for unknown screening, but the request was for a list of specific compounds?

DR. SHE: Majorly about unknowns. We do not know what they are, but IRB panel suggested that we give the specific explicit list of chemicals we are already know.

CHAIRPERSON LUDERER: And then you mentioned that you had then provided the library list?

DR. SHE: They asked us to go back in December. That's our plan to provide a library which covered as much as we can. So I just wonder if that's the best approach. How that approach will affect the future of the unknown screening program?

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: I don't have any solutions. I just wanted to say that with unknown screening, a concern of the human subjects review board, or IRB, is the potential and the ability to find drugs of abuse in your samples without meaning to. So it may be that by specifically addressing the desire to not look at those or to explicitly address the ability to find chemicals that may put human subjects at risk may be helpful in the IRB response.

CHAIRPERSON LUDERER: Dr. Fiehn.

PANEL MEMBER FIEHN: Yes, indeed. I mean, in our own exposure analysis, we find drugs of abuse very frequently, roughly at the percentage that has been reported in the literature. We also find many pharmaceutical drugs, of course, and metabolites of those drugs. So once you go for, you know, exposome type of studies, you find a lot of things that if the data are public in principle could be even used to de-identify people.

So there is a certain risk with that if you have additional metadata like the region or the cohort, like the firefighters, or, you know, so you can always narrow down. And then you say, well, there's only so many firefighters in that region that would also have asthma, say, right? Well, because you may -- and then this person took some illicit drug.

So there is certain risk of, you know, in these kinds of types of exposure studies, but I understand that this program only releases aggregated data. And in this case, you know, I think the confidentiality is preserved. So it is interesting in the sense of knowing to what people are exposed to. And since, you know, the data are themselves are not public, as I understand, correct me if I'm wrong, but it's not like a database, you know, with, you know, that people can be downloaded. So it's only aggregated forms like one percent we found cocaine and so on, right?

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: Yeah. I think the question was how best to respond to IRB concerns? So certainly your comments could be used for that, but I might make an argument to explicitly say you're not going to look for certain things, as well as reporting aggregate data, including those items that you mentioned,

especially, that's a really good point, about the pharmaceuticals as well as drugs of abuse, as they can also be used to identify people, if it's rare disease.

And so -- but we've approached in some studies, where we said we'll specifically not look for X, Y, and Z. And that is something to think about as a possible response to the IRB committee, depending on their concerns. That was one of the biggest concerns for our personal IRB at our university.

CHAIRPERSON LUDERER: Dr. Fiehn.

PANEL MEMBER FIEHN: We run something like 25,000 samples in our center, so we are mostly blood, some urines. We have never had this issue. So the IRB committees at Davis have never asked for that. And so because mostly it's about concerns -- and, yes, of course, lots of reports you do and lots of trainings you have to do and so on, but mostly it's concerned about the individual subject, so that the individual subject might be put into harm.

And if you get anonymized samples, and you get just a identifier -- a subject identifier, there is very little possibility that this subject might be de-identified, especially now if then the data are not going to be public.

So I do not see any reason not to look for

unknown unknowns or known unknowns. And indeed, you know, this might be important information for the public to see in an aggregated form. So I would actually advise against trying to limit your efforts, especially if you now have invested in machines, like the Q-Exactive Plus and the Agilent 6550, you know, that can look at these compounds in an untargeted way.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: I was going to limit my responses to the last time, but I feel compelled to answer.

(Laughter.)

PANEL MEMBER QUINTANA: I think from the community and participant point of view, the potential to look for drugs of abuse has always been a barrier to participation, especially I think people here that work in occupational settings. They were always worried if they participated in occupational biomonitoring programs that those samples would be used in some way. And so often consent forms might explicitly say these will never be used to measure this, depending on the studies. For that reason, so I think -- I think we have to balance community concerns and barriers to participation with some of the scientific knowledge issues that you brought up.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: Just a little our own experience with this. We dealt with this, of course, part of the CHAMACOS studies, and we, you know, in our consent forms, explicitly said that we will not be looking for drugs of abuse and other kinds of illegal exposures, that we were focusing on environmental chemicals, meaning things used in commerce and pesticides and things like that.

I think Dr. Fiehn's perspective is important. I think the key is that analysis be consistent with the consent form. And, you know, it may be in some circumstances you want to limit that consent form to make sure you don't affect participation. I can see how there could be some complications with, for example, genetic -- the samples from the Genetic Disease Program, where I'm not sure people actually signed a consent form about their participation. So in that case, you're using anonymous material, so some of these issues may not be pertinent.

I think one thing to consider though with the unknown analysis is that the goal is to look for unknowns and then identify them, and those that then may become targeted analyses in future biomonitoring programs. So for method development and kind of biomarker discovery, I think using completely anonymized samples is potentially very useful. And to the extent that we identified new

targets, those then can become part of protocols to analyze for those compounds that we now have concerns about.

And so there may be -- you know, in that case, there may be no tension with whether we're developing population level data on drug abuse or things like that. Rather, it's kind of a biomarker discovery process for environmental exposures. And that will then lead to targeted analyses that will, you know, inform the Program.

MS. DUNN: Dr. Luderer, would it be all right to -- a public commenter would like to weigh-in on this discussion?

CHAIRPERSON LUDERER: Great. Wonderful.

MS. BUERMEYER: Good morning. Thank you very much for letting me go out of order, but this is a fascinating conversation that I wanted to comment on briefly. The issue of identifying illegal substances in biomonitoring is, in fact, as was pointed out by Dr. Quintana and Dr. Bradman, very concerning for a lot of communities.

We're involved, along with Commonweal and some others, in a biomonitoring program for women firefighters in San Francisco. And there is great concern about any of the data from that program getting into the hands of the fire department in particular, but certainly anything

around illegal drug use would be huge. So I just wanted to sort of weigh-in on that.

And I also wanted to say to Dr. She, there is an unknown analysis going with that program, and we had to get through the IRB at UC Berkeley. So Rachel Morello-Frosch might be a resource to go to to see how she -- And I think it -- well, it might have been actually UC San Francisco, yeah, but they would have had to negotiate that mire, and she might have some thoughts for you about how to get through that process.

Thank you again.

MS. DUNN: Could you identify yourself.

MS. BUERMEYER: Nancy Buermeyer with the Breast Cancer Fund.

CHAIRPERSON LUDERER: I was just about to say that.

(Laughter.)

CHAIRPERSON LUDERER: Thank you very much.

Any other comments or questions from Panel members? I think we had a really interesting discussion.

Dr. McKone.

PANEL MEMBER McKONE: Just a clarification. I think the -- I mean, we've focused a bit on drug use, but in general, it's all uses. I mean, you take a sample of blood, it's loaded with a lot of information about

somebody's health status, you know, whether they're taking -- it doesn't have to be illegal drugs, just for some people knowing -- they don't want people to know they're taking, what, statins or blood pressure medicines or whatever, I mean, because it might put them in a vulnerability that they don't want to be in. It's private information, so I think we have to be careful it's not just illegal drugs. It's also legal drugs that will profile you as having a certain disease or vulnerability that you may not want to reveal.

And it is -- I mean, it's intended to protect against all of that. I just -- I think we should broaden the discussion not just on illegal drug use, but to broad information that's in blood about a person.

CHAIRPERSON LUDERER: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Yeah, I would strongly support what Dr. McKone just said. And sort of picking up where Dr. Bradman left off, I think that -- I also can't -- I think pointing towards the sort of anonymized sample use in this process of early method development is really appropriate and helps side-step a lot of these issues.

I can't think of the relevance really either of identifying most of the compounds that we're discussing, whether it's drugs of abuse or prescription medications,

in terms of interactions with environmental exposures or relevance for health outcomes. And so in especially thinking about the method development stage, I would support this idea of totally anonymizing the samples and perhaps that helps with the IRB issues as well.

CHAIRPERSON LUDERER: Dr. Fiehn.

PANEL MEMBER FIEHN: Well, the science is very clear, of course, that drugs are made to target specific enzymes. So if we think about health outcomes and vulnerabilities and outcomes of exposure to environmental chemicals, and ultimate health outcomes, you cannot ignore the relevance of, you know, drugs that are made to interact with enzymes. So it is important information.

Now, obviously, and we all agree, you know, consent forms have to be followed and obviously it has to be aggregated information and so on, but there must be a way, if we find those, to report it, because there is -- you know, even in clinical trials and so on, that's the same discussion that is going on in other types of studies, where people say, you know, we need to know more about these effects. And that's called, you know, precision medicine or personalized medicine.

So these are the discussions that are going on. The same with genomics and so on. So we -- you know, at some point, we want to be able to link exposures to health

outcomes. And in these exposures, we cannot just say to industrial chemicals, but also, of course, to food -- I mean, you know, we -- in these untargeted analyses, you know who is a coffee drinker. Now, this is not, you know, direct information but, hey, maybe it has something to do that you can say, you know, do we have increased risk once you have health outcome data, if people are coffee drinkers and they're exposed to certain priority pollutants or others.

So, you know -- and you cannot, of course, consent on all compounds. So once you say we go away from a targeted perspective, of only environmental pollutants that come from pesticides and other chemicals, household chemicals, and we go towards, you know, exposome type of studies, you know, there is the need to be real clear about the confidentiality of data and not access of data, and not being able to de-identify, you know, certain subjects, but it is very difficult to conduct these studies and maybe then redact the compounds of interest, because at some point, you know, there might be unknowns with an MZ mass and retention time. And other people might identify oh, this is so and so, you know, drug of a so in so, you know, illicit compound.

So, you know, I mean, of course, you -- you know, the problem is basically to be able to secure the data,

and in the same way it's done for clinical trials. There's a lot of history how to secure patient confidentiality and subject confidentiality.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: I think that anonymizing is critical for these samples, but we cannot use that term to mean the same between a small study and a large study. Because I would say using the example that our speaker brought up of female firefighters where you have samples in the hundreds, even if finding at the pop -- at the total sample level that two percent of firefighters took cocaine or something could harm all the participants or even female firefighters, which -- and so it's qualitatively different than a study of every California mother, you know, which might be the genetic disease database. And so just anonymizing a study, if it's fairly small, doesn't do enough, I think.

CHAIRPERSON LUDERER: All right. Thank you. I think we've given the Program a lot of food for thought on this topic, and it was a very interesting discussion, I thought.

So I think that that wraps up our morning session. And before we adjourn for lunch, I just wanted to give Fran Kammerer, the staff counsel for OEHHA, to give a reminder about Bagley-Keene. And I also wanted to

announce that we have about an hour and five minutes, I think, for lunch. And we'll start the meeting promptly again at 1:15. So actually, I guess we have a little bit of extra time, because we're ending a little bit early this morning, so we have an hour and 15 minutes.

There's various different options for quick dining, including the cafeteria on the first floor of this building and then Cafe Soleil, which is in the middle of Cesar Chavez Park just across the street. And there are also a few quick options on K Street.

So, Fran.

STAFF COUNSEL KAMMERER: Thank you, Dr. Luderer.

I just want to remind you that after you've heard all this exciting information, I'm going to rain on your parade and ask you not to discuss it at lunch time, but wait until you get back here, so that you can discuss it here, and the public gets an opportunity to participate in that discussion.

Thank you.

CHAIRPERSON LUDERER: All right. Then we'll adjourn for lunch.

(Off record: 12:00 PM)

(Thereupon a lunch break was taken.)

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

(On record: 1:15 PM)

CHAIRPERSON LUDERER: All right. I think we --

DIRECTOR ALEXEEFF: Can I get your attention, please? We're going to resume the meeting.

Thank you.

Dr. Luderer.

CHAIRPERSON LUDERER: We're still missing one Panel member. We're missing one Panel member, but I guess we'll --

MS. HOOVER: Just start.

CHAIRPERSON LUDERER: Okay. All right. We'll go ahead and start.

I'd like to call the meeting back to order, and I'd like to welcome you all back from lunch, and introduce you to our next agenda item, which is very, I think, exciting topic. We're going to -- and I wanted to provide you a little bit of background about it first.

So we, in 2008 in December, the Scientific Guidance Panel recommended that diesel exhaust be added to the list of designated chemicals. And then subsequently in March of 2009 recommended adding it to the list of priority chemicals. And the Panel then requested an update on developments in identification of potential biomarkers for exposure to diesel exhaust. And that has

culminated in this special afternoon session that was developed by Program staff in response to the Scientific Guidance Panel's request.

There was a list of selected references related to the topic of diesel biomonitoring posted on the Program website, and it was also sent to all Panel members. A sample packet with copies of those references is also on the table in the back of the room.

During the first part of this afternoon's session, we're -- we have two guest speakers who are going to be presenting on challenges in measuring exposure to diesel exhaust and nitropyrene metabolites as biomarkers for diesel exhaust exposure.

We'll have ten minutes for questions after each presentation. And then following the two presentations, Panel, guest speakers and audience will discuss strategies for studying communities highly exposed to diesel exhaust.

And I wanted to just remind everyone that the -- the community studied by Biomonitoring California can be geographically or non-geographically based, and, for example, can include an occupational population.

So now it's a real pleasure to introduce our first speaker, Dr. Melanie Marty. Dr. Marty received her Ph.D. from the University of California at Davis in pharmacology and toxicology. And she's currently the

Assistant Deputy Director in the Scientific Affairs Division of OEHHA, where she helps oversee production of scientific assessments of environmental chemicals, and participates in policy development and administration of the Office. Dr. Marty was previously the Chief of the Air Toxicology and Epidemiology Branch in OEHHA.

During her tenure, OEHHA issued a major risk assessment on diesel engine exhaust, which provided the foundation for identifying diesel engine particulate matter as a toxic air contaminant in California, and for development of the Airborne Toxic Control Measures by the California Air Resources Board, known as CARB.

Dr. Marty has authored/co-authored numerous articles and publications relating to environmental risk assessment. And she's also an adjunct assistant professor at the University of California, Davis in the Department of Environmental Toxicology.

So please welcome Dr. Marty.

(Thereupon an overhead presentation was presented as follows.)

DR. MARTY: Thank you, Dr. Ulrike.

So it's really funny for me to be called a guest speaker, since I practically live in this building, but anyway.

Okay. So I'm going to just walk you through a

couple of, really, concepts.

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DR. MARTY: So the first is why are we concerned about diesel engine exhaust exposure? A little bit of history on diesel engine exhaust as a toxic air contaminant, as part of ambient particulate matter, and a little bit of information on exposures in California.

Then I'm going to touch on what is in diesel engine exhaust, what is that, and the compositional changes that we might expect in the future, what are the characteristics of a good biomarker, and then some of the complications inherent in trying to find a good marker for diesel engine exhaust exposure.

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DR. MARTY: So here's an extremely brief history in terms of the carcinogenicity. IARC in 1989 grouped it as 2A carcinogen based on sufficient evidence in animals and limited evidence in humans. Other organizations have looked at the data over the years, including HEI and WHO. And both of those organizations concluded that the epidemiological data was consistent in showing weak association between exposure and lung cancer.

Then California identified diesel engine exhaust particulate matter as a toxic air contaminant in 1998. And in the health effects assessment, we noted that the

evidence is consistent with a causal association between diesel engine exhaust exposure and lung cancer.

Then most recently in 2012, IARC upgraded the classification to Group 1, based on sufficient evidence for carcinogenicity in humans again for lung cancer.

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DR. MARTY: There have been, as you can imagine, increased lung cancer risks observed in numerous studies of diesel engine exhaust exposed workers. That's why IARC labeled it a Group 1. And that was the primary basis for listing as a toxic air contaminant. The targets of toxicity include the respiratory system and the immune system, and also, I should add, the cardiovascular system.

We have seen enhanced allergic response in human exposed to diesel engine particles directly. We've seen pulmonary inflammatory changes and changes in cardiovascular measures after controlled exposure of human volunteers.

And there are some indications in the literature of increased incidence of chronic obstructive pulmonary disease in workers with long-term exposure.

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DR. MARTY: Diesel exhaust particulate is also a component of ambient PM2.5. And as you're aware, there has been much work looking at the adverse health impacts

of exposure to ambient particulate matter. There are literally hundreds and hundreds of studies showing consistent associations of ambient PM2.5 with daily and long-term cardiopulmonary mortality, hospital and emergency room visits for cardiac and respiratory illness, acute and chronic respiratory symptoms, lung function decrements, and decreased lung function growth in children, school absenteeism, medication use and symptoms in asthmatics.

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DR. MARTY: This graph depicts the results of OEHHA's meta-analysis. So in 1998, OEHHA, as part of the team that works on identifying toxic air contaminants, conducted a health effects assessment. As part of that assessment, we reviewed the literature to date then. This is a figure looking at our meta-analysis, where we evaluated studies that had looked at the relationship between diesel engine exhaust exposure in the workplace and lung cancer. And you can see from the figure that the effect estimates jump -- you know, jump up and down right above 1. Some of them statistically significant in the individual studies. Using our meta-analysis -- analytical techniques, we can see that the relative risk is around 1.4 and it's highly statistically significant.

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DR. MARTY: There have been a number of studies since 1998 published about this relationship. For example, these are just a couple that I selected to put into this table, to really show you that the relative risks or hazard ratios jump around between around 1.4 and as high as 2 or so.

Interestingly, there Laden published a paper in '06 and provided an odds ratio for COPD of about 1.6, also statistically significant. And this is for a group of railroad workers who worked in the industry after engines were dieselized. So they used to be electric and then they became diesel in the fifties.

And finally on this slide, I wanted to point out that a recent meta-analysis of three cohort studies published in Occupational and Environmental Medicine by Vermuellen, noted in their conclusions that based on estimates globally of diesel engine exhaust, about six percent of annual lung cancer deaths may be, may be due to diesel engine exhaust exposure.

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DR. MARTY: As part of our identification of diesel engine exhaust, as a toxic air contaminant, OEHHA conducted an assessment of the potency, that is the slope of the dose response curve, for cancer effects. We included bracketing assumptions about historical exposure

of railroad workers. So we based the estimates on a couple of studies by Eric Garshick on railroad workers. And essentially in a nutshell, the 95 percent upper confidence limit on the slope of the dose response curve ranged from about 1.3 times 10 to the minus 4 to 2.4 times 10 to the minus 3 per microgram diesel engine particulate per cubic meter.

So I just wanted to note that the quantitative risk assessment was subjected to extensive public scrutiny, reviewed by the State's Scientific Review Panel and adopted. And we have been using, what we term, a best value of 3 times 10 to the minus 4 per microgram diesel engine particulate per cubic meter as the slope that we use to estimate risk from ambient exposure.

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DR. MARTY: I just want to say just a word on the form of a listing as a toxic air contaminant. Diesel engine exhaust, as you can imagine, is a complex mixture. There's a whole bunch of different chemicals. Some of them are gas, some are aerosolized liquid, some of them are liquid absorbed onto particles, and then the fine particles themselves.

Both the particulate matter and vapor phase emissions are most likely involved in contributing to the adverse health effects, including cancer. The California

Air Resources Board, or CARB, listed particulate matter from diesel-fueled engines as a toxic air contaminant. Although the health effects assessment was based on exposure to the mixture.

So there's a couple reasons for doing that, one of which is not on this slide, and that is that the industry hygiene measurements in the occupational studies were of the particles themselves. But also, this enabled the measurement of diesel emissions in the ambient air to be made, and also coming out of the tailpipes. And it provided a way for ARB to monitor the results of their diesel emission reduction strategies.

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DR. MARTY: In 1998, ARB conducted an exposure assessment and looked for various measurements of diesel engine exhaust in ambient air. So you can see in California, at that time, it ranged, depending on where you were measuring, from about 0.2 to 3.6 micrograms per cubic meter with some urban hot spots, mostly downtown urban canyons, up to about 15 micrograms per cubic meter. And note that the occupational exposures were considerably higher.

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DR. MARTY: Since then, the Air Resources Board has adopted a number of, what we call, Airborne Toxic

Control Measures. And these are regulations promulgated to reduce emissions from a variety of sources. From about '05 to 2012, as this histogram depicts, there's been about a 45 percent reduction in PM2.5 emissions from diesel sources in California, as a result of promulgating these regulations, and industry coming to the plate and making changes also.

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DR. MARTY: The next couple of slides are really just designed to give you an idea of the types of exposure in California and really the heterogeneous nature. So I think you're all familiar with the CalEnvrioScreen, and this is a program that uses mapping software to overlay indicators of exposure, and also other indicators, on the map of California.

So one of the exposure indicators that is in that program is diesel particulate matter emissions. So these aren't concentrations, these are emissions. And in this case, there are emissions for a summer day in 2010 from both on-road and off-road sources. The emissions estimates were conducted by the Air Resources Board for 4 kilometer by 4 kilometer statewide grids, which we then converted to census tract.

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DR. MARTY: This is blowup of what that looks

like for Southern California. And you can see that cities with census tracts in the top 10 percent for diesel engine emissions fall within Los Angeles County, Riverside, Orange and San Bernardino County. And if you look really closely a lot of it is along major roadways or near ports, so near major sources of emissions.

And note the heterogeneous nature, so some people live in areas where there is a lot of diesel engine exhaust and some people don't.

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DR. MARTY: This is the same figure for the Central Valley. Fresno pops up as having a city in the top 10 percent for diesel pollution, but there's also areas in Kern and Merced County as well. And again, it follows the interstate corridors and industrial areas.

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DR. MARTY: And this is the same figure for the San Francisco Bay Area. So we have Alameda, Oakland, Emeryville, Hayward, Berkeley, and downtown San Francisco, in the top 10 percentile for diesel engine emissions.

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DR. MARTY: Well, what is a diesel exhaust? It's really, as I mentioned, a mixture of a lot of different substances. There's gases, like carbon monoxide, nitrogen oxide, sulfur oxides, and a large number of volatile

organic carbons -- compounds, including formaldehyde 1,3-butadiene, and so on.

There are a lot of particles in diesel engine exhaust, most of which are less than a micron in diameter. So these are pretty small particles and they're respirable and can get into the deep lung.

The particle itself has an elemental carbon core. There's metals adsorbed, metals from engine wear, for example. And then there's organic chemicals also adsorbed to the particle, many thousands of them actually, and can make up to more than half of the particle mass. This includes polycyclic aromatic hydrocarbons, and a number of PAH derivatives, including the nitro-PAHs oxy, keto, quinones and so on, and other products of incomplete combustion.

What are the key chemicals that are responsible for the adverse health effects? That's a big question. We have theories and there's some things that are known about some of the chemicals, for example, the PAHs that are very consistent certainly with lung cancer.

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DR. MARTY: Well, what makes a good biomarker?

So there's a couple of things that are useful qualities of a biomarker. It has to be somewhat unique to the substance or mixture being measured to avoid major

confounding by other sources. There should be a consistent quantitative relationship with external measures of exposure, so you have internal measures and external measures that are -- that have a consistent relationship.

It should be reliably measurable with reasonable analytical methodology. It should be useful at low levels of exposure. This is particularly important for community monitoring. And finally, it would be nice if there's low interindividual variability in pharmacokinetics, for example, for -- if it's a metabolite, to avoid a lot of variance.

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DR. MARTY: As I mentioned that ARB has taken a number of risk management actions to address diesel exhaust emissions. This includes for off-road sources and on-road sources, so heavy-duty light-duty, buses, idling issues, and also from marine sources, including shore power, so transferring from using diesel to energize your ships to using electricity. That's an example.

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DR. MARTY: Well, that has changed the emissions, and it certainly reduced the emissions. We can see that measurably. In addition, there's been changes in fuels over time. So in 2006, the CARB regulations phased in,

really it should be, ultra low sulfur fuel. So the fuel now is down to 15 parts per million sulfur, and it used to be around 50, and before that it was an order of magnitude higher.

And the lower sulfur fuels result in lower particle emissions, in part because of less formation of sulfate. The CARB diesel, as it's called, also has a lower aromatic content, so you're starting out with less aromatics to make polycyclic aromatics. And then CARB has to set lubricity standards so that the engines run right, and that also changed the composition somewhat of the fuels.

The CARB diesel we know has decreased emissions of PM mass, of nitrogen oxides, of PAHs, and nitro-PAHs in some cases, and a number of other constituents that have been measured as quote, total hydrocarbons.

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DR. MARTY: The fuels they keep on a changing. So there's other control influences that are -- controls that are influencing the emissions. The relative amounts of various constituents change with the engine that you're using to burn the fuel, the type of fuel you're burning, the mixing ratio. And by that, I don't mean, oxygen to fuel. I realized after I made this slide that that's probably what most people think that means. I mean, for

example, if you're mixing biodiesel with diesel, 10 percent biodiesel, 20 percent biodiesel, it affects the emissions and the ratio of the constituents.

And also fuels are changing beyond CARB diesel, because of the push to lower carbon fuel to help on the greenhouse gas side. So we have biodiesels and blends, and we also have something called renewable diesel, which you actually make the diesel with little carbon molecules.

So there are a number of studies that are ongoing that are evaluating changes in the constituents with the changing fuels, and they present a rather complex picture. For example, the PAHs seem to go down quite a bit with some biodiesel fuels, but less with others, and in a couple cases might even go up. So all these changing ratios of constituents complicates finding a good biomarker for exposure.

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DR. MARTY: In your packet, you guys got a review article by Margot(mar-go) or Margot(mar-got). I don't know how to pronounce his name. And he walked through a number of the biomarker candidates that have been explored. So these include urinary excretion of either parent or oxygenated metabolites of a number of PAHs, protein adducts of carbonyl compounds, including a number of aldehydes that are found in diesel exhaust.

But they all have a specificity problem, or most of them, so there's lots of confounders for most of the candidates, including exposure to tobacco smoke, cooking food, other fuel combustion. So all those Burger Kings out there actually do contribute a lot to air pollution.

Those short half-lives of urinary metabolites are also a possible problem for infrequent exposures. It's a little less of an issue for occupational exposures where you know when the people are exposed and you know when you took the sample. But for community exposures, there is probably peak exposures like when you're waiting for a bus or your commuting, and where that is in time in relation to when you take the sample is an issue, if you have a short half-life metabolite that you're trying to measure.

And again, I mentioned earlier, interindividual variation in toxicokinetics influences metabolite production. For example, just, you know, simply thinking about genetic polymorphisms in the CYP enzymes or nitroreductase or any of the Phase 2 conjugating enzymes will lead to variation in the metabolite production across the population.

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DR. MARTY: Other biomarkers explored have included the nitro-PAHs. So there are a number of nitro-PAHs formed during combustion of diesel fuel. One

of them that's been most explored, and you'll hear about that in a second from Dr. Simpson, has been 1-nitropyrene, and in particular measuring the urinary metabolites of 1-nitropyrene.

This particular nitro-PAH is found, especially in diesel engine exhaust, and less so in other sources, including tobacco smoke. So it has a better specificity. And as I mentioned, Dr. Simpson will discuss his methods and results using a number of hydroxylated metabolites of 1-nitropyrene as potential biomarkers for diesel exhaust exposure.

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DR. MARTY: Other potential biomarkers include hemoglobin or other circulating protein adducts with diesel exhaust specific compounds. So that's another avenue that could be explored. Generally, the adducts have a longer half-life than urinary metabolites. And this is a benefit, especially if you're looking at chronic exposures to the community, and you have this issue of not knowing when they were exposed versus when you take the sample.

And there are a number of compounds, for example, like some of the quinones you find enriched in diesel engine exhaust. And so they offer a potential route to a biomarker. You still have specificity issues, because

there are a number of sources of those. And in particular for the quinones, there is a lot of atmospheric transformation going on, if it's hot and sunny like in Los Angeles, and it could be for some quinones that the majority of your exposure is secondary transformation products, rather than any primary source.

So -- and finally, if you have something where you have to measure blood, that's more invasive, more expensive than collecting urine, even buccal samples is probably more expensive than collecting urine.

So I think in a nutshell, there aren't any grand slams yet. I hate to use that baseball thing, but I am a Giants fan.

(Laughter.)

DR. MARTY: So, you know, I think there's more areas to explore and more work to be done.

I'm done.

CHAIRPERSON LUDERER: Thank you very much. That was a really interesting overview. Great. And we have time now for some questions from the Panel, as well as possibly some time for public questions. And then we'll have additional time for discussion and questions afterwards.

Dr. Fiehn.

PANEL MEMBER FIEHN: Thank you. It was a very

good overview, very informative. Now, if you look for biomarkers and you say these should have not differences in individual PK/PD between people, and then you say, well, we should prefer to looking at urine, because that's easier to get as a sample, I see there a contradiction, because whatever you find in urine means it's being excreted, it's being metabolized. And we know that excretion rates are different from person to person. So I wonder, you know, what to make out of it? I see your conflict there.

DR. MARTY: Okay. Yeah. No, that's a good point. So, you know, I think there -- well, there are some PAHs that are excreted unchanged. So I think a few of those have been evaluated as potential biomarkers, except the problem like 1-hydroxypyrene is an example. There is -- there are other sources, so it's not you get a specificity issue.

And then there's variability, and then there's variability. So for some things there's going to be more variation in production of metabolites than for other things. You'll never get around that issue. It's really impossible if you're looking at a metabolite, as you point out.

CHAIRPERSON LUDERER: Dr. McKone.

PANEL MEMBER McKONE: Yeah, I also want to

compliment. That's a -- it was really interesting to follow all of the information.

The thought I have is, I mean, there's no grand slams yet. And actually what I fear is there may never be a grand slam in a biomarker. That is if we're a purist and we just want something biological to tell us an exposure, but if we want to know an exposure, right, and want biological information as part of that, I mean, this is where -- and I'm just sort of quoting from the National Academy's study on exposure science for the 21st century, which is sometimes you gain a lot by allowing a convergence of different tools, like models, activity tracking, and biomarkers, and you get more from that than you would get from any piece alone.

And this is actually not a new idea. It's just the idea that well, sometimes when you're frustrated with one tool and then you've got another tool, and all your tools are unreliable, but sometimes if you use two or three tools together, you can achieve something you never could have done with any one of them alone.

And I don't know if there's some thought about, you know, going a little bit beyond the purity of just having a biomarker to going to the idea that we need to understand exposure, and then we can merge our different tools together?

DR. MARTY: Yeah. No, that's a really good point. And actually, that was brought up when somebody came before your panel in 2008 to look at not just one but multiple markers. And in that case, they were really thinking of biomarkers in blood or urine. But you are bringing up another issue in -- you know, if you're going to do a biomarker study, have additional exposure metrics to complement it that aren't necessarily biomonitoring, but external measurements of exposure. So that's actually a neat idea.

CHAIRPERSON LUDERER: Any other questions from Panel members or if any member of the public has a question at this point, I think we have time for a couple of questions as well.

PANEL MEMBER McKONE: Am I allowed to do another one?

CHAIRPERSON LUDERER: Dr. McKone.

PANEL MEMBER McKONE: So, I mean, you brought this up briefly and I think it's -- it could be really problematic about what is diesel, because it's changing so dramatically. And, I mean, it's not just that we have renewable diesel and biodiesel. And biodiesel is going to look a lot different. Renewable diesel is going to look pretty much like existing diesel, because it's made the same way just from renewable feedstock, but what about

something like dimethyl ether, which is proposed as a substitute?

Do we even call that diesel? I mean, is it what's used in diesel vehicles or is it really -- I mean, I think that's as problematic as measuring it as actually what is the beast that we're trying to understand, because it's changing so much.

DR. MARTY: Yeah, well, that also is another issue. So I think it's pretty safe to say that we're not going to like turn the fleet over into a biodiesel fleet completely in the next few years. So right now -- there's just not enough feedstock for that. So right now, if the trend is more towards mixing petroleum-based diesel with biobased diesels, and 80 percent of it is still petroleum-based diesel. So it maybe less of an issue in the shorter term. Maybe way down the line, we'll have to rethink what are we measuring, and what is it?

So I think it's a little bit less of an issue. And there are people in this audience from the California Air Resources Board who are much more knowledgeable in this arena than I, so -- and I think they may have some comments in a little bit.

CHAIRPERSON LUDERER: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Thanks. Yeah. Thank you for the informative presentation. I think a related

issue that was raised in one of the background articles is the increasing use of filters and the requirement for use of filters, which I guess is much more prevalent in Europe right now, but is coming on line in California, and how that has changed the particle size largely.

But I wonder what also is changing about the percent of chemical constituents and how we think about that when we're looking at exposures, you know, over the next decade?

DR. MARTY: Yeah. And actually, they are on line in California, and this was part of the Air Board's mitigation measures for reducing exposure. And there are a number of studies, mostly from, what they call, chassis dynamometer studies. So they put an engine on a block and run it as if it's running down the highway or if it's idling and measure what's coming out the tail pipe.

And we know that there have been large PM mass emission reductions from the diesel particle filters, and large PAH reductions. So when it comes to the individual nitro-PAH's, or what have you, the data are a little less robust, less measurement. And again, the Air Resources Board folks have been doing some of that work looking at that.

There has been some concern about an increase in ultrafine particle number, because of the diesel particle

filters, and that's an open question, in terms of what does that mean for both biomarkers of exposure, but also effects, health effects, so -- and I think there are folks here who can answer that question much better than me.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: Hi. You brought up the -- and thank you again for a very nice presentation, where you brought up some of the difficulties of saying what is diesel?

And so I think it's helpful to have discussions about what we're trying to do with the biomarker. Are we trying to get a surrogate for exposure to any truck that is called a diesel truck, running on any diesel or are we trying to get exposure to the most harmful components of diesel or perhaps a measure of exposure at a neighborhood to trucks that haven't been retrofitted or improved?

And so I think you pointed out the -- that we don't exactly know what is -- what are the most harmful components of diesel. But as we understand that, perhaps our markers should focus on those, because that's really the reduction we'd like to show from California's extremely impressive, and one of the great public health stories of this last 20 years I think is, the diesel reduction efforts in California. And having the ability to show that through biomonitoring, this success story,

you know, is a very powerful tool.

DR. MARTY: Good comment.

CHAIRPERSON LUDERER: And yeah, I'd actually like to echo that too. I mean, I think that is one of the really important uses that the Biomonitoring Program has shown for biomonitoring is the ability to show the effects of public health interventions on toxic substances of interest. You know, we think of the PBDEs, and I think in some ways this could be very analogous to that with changes in regulation and being able to demonstrate changes in exposure that result from that.

So we -- I'd like to thank you again for your interesting presentation, and we'll have time for more discussion and questions very soon.

But now I would like to introduce our next speaker, Dr. Chris Simpson. And Dr. Simpson received his Ph.D. in Environmental and Analytical Chemistry from the University of British Columbia. He then undertook post-doctoral training at the University of Minnesota, and then at the University of Washington in Seattle, where he is currently Associate Professor in the Department of Environmental and Occupational Health Sciences in the School of Public Health at the University of Washington. There he directs the Exposure Sciences Program.

Dr. Simpson's research involves applying state of

the art analytical techniques to understand and control human exposures to hazardous chemicals. He has a particular interest in biological monitoring of chemical exposures in both occupational and non-occupational settings. And his group has, for the past 10 years, been pursuing research towards development of a potential biomarker of exposure to diesel exhaust.

Welcome, Dr. Simpson.

(Thereupon an overhead presentation was presented as follows.)

DR. SIMPSON: Thank you very much for that introduction. And as Dr. Marty mentioned, I'm going to be talking now about one specific class of biomarkers, or proposed biomarkers, for diesel exhaust, and that's the metabolites of the chemical 1-nitropyrene.

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DR. SIMPSON: I think I can probably skip over this first slide because Dr. Marty did such an excellent job of teeing up the motivation for why we're concerned about diesel exhaust, and why we're interested in having a tool for biological monitoring of exposure to diesel exhaust.

It's been mentioned several times already, diesel exhaust is a complicated mixture, including many different organic compounds and inorganic compounds, gaseous

particle phase semi-volatile materials. And so definitely one of the challenges in any kind of exposure assessment for diesel exhaust is identifying what specific component one ought to measure. And that's the -- that's not a problem that we're going to be able to get around.

Variation in the emission profile of diesel exhaust is unavoidable. Even for a specific type of engine, the chemistry of the emissions changes due to the operating conditions of the engine. So if it's under load, it's going to be producing a different mixture of emissions compared to if it's cruising at a freeway speed or not under load.

So that's something that we have to be aware of, but not necessarily something that we can avoid.

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DR. SIMPSON: So I just put up this slide to give me the opportunity to highlight that biological monitoring can be thought of as a complementary approach to understanding exposure when compared to traditional environmental monitoring. Importantly, it can also be used to validate predictive exposure models that may be based on, for example, emissions estimates or land-use characteristics. And I think you talked about that a little bit already that the biomarker itself does not have to be a perfect measure of exposure, but it can be a tool

that you can use to validate some of -- some of the other exposure prediction tools that you are using that might be a little less expensive or more generally applicable.

So this particular slide is really just summarizing some of those key advantages of biological monitoring as a tool for understanding exposure. And of the four listed on the slide here, I would say that the top three, the idea that you're capturing absorbed dose, particularly differences in exposure, due to breathing rate, for example; and the idea that perhaps that biological monitoring is somewhat easier to implement on a larger scale compared to collecting personal exposure samples.

Those are certainly personal air exposure samples. Those are important points. I think that the integrating multiple routes of exposure is perhaps more of a complication in the context of diesel exhaust exposure. Though it seems unlikely that from a health perspective the routes, other than inhalation, are going to be important as a health concern.

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DR. SIMPSON: So the compound that I'm going to be talking about is 1-nitropyrene. And we have known for many years that nitro-PAHs in general, and in particular this compound, are present in relatively high levels in

diesel exhaust. Nitropyrene is formed by the nitration of polycyclic aromatic hydrocarbons.

This compound is much more specific to diesel exhaust than any of the other commonly used surrogates, such as black carbon or elemental carbon or nitrogen oxides.

It's important to admit that 1-nitropyrene is not absolutely unique to diesel exhaust. In the IARC monograph on nitropyrene you'll find several examples where it's reported that 1-nitropyrene is generated by non-diesel sources.

However, it is generally true that most of the nitropyrene, or most of the 1-nitropyrene, that people are exposed to in the ambient environment, that is derived from diesel exhaust. And I'm going to go through three or four slides that I hope illustrate that point for you.

It should also be noticed that in contrast to the other nitropyrene isomers, 1-nitropyrene, for most part, is not formed to a significant extent by a photochemical reactions. So that isomer 2-nitropyrene that very much is formed from secondary photochemical chemical reactions and is not specific to diesel exhaust. There have been a few examples where it's been shown that it is possible to form 1-nitropyrene from secondary reactions, but that makes only a small contribution to the total overall ambient

1-nitropyrene concentrations.

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DR. SIMPSON: So this is one slide that illustrates some example data demonstrating that, in general, the emission factor for 1-nitropyrene is dramatically or typically much higher for diesel exhaust than other combustion sources. So in this particular example, the enrichment factor per gram of particulate matter is at least 40-fold.

In general, 1-nitropyrene emissions and particle emissions also are dramatically lower in new generation diesel engines compared to traditional diesel engines. So that is a point that certainly we have to acknowledge. Nevertheless, in the data that I'll show you, 1-nitropyrene is certainly present and currently used in diesel engines.

The exhaust treatment technology does make a big difference. There's a lot of data in the IARC monograph on that, indicating that diesel particulate filters, especially are very efficient at removing both particles from exhaust, but also the nitropyrene as well. However, there are examples where the emission control devices has not -- have not performed as one may have expected. And again in the IARC monograph, there's several examples pointed out where adding a diesel oxidation catalyst,

which generates more of the nitrogen dioxide, had the effect of increasing nitropyrene compared to the same engine and fuel combination without the diesel oxidation catalyst.

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DR. SIMPSON: So here's some environmental data collected in Japan, where they measured a series of different PAHs and nitro-PAHs, and used a combination of source testing and source apportionment in order to calculate the contribution or the fraction of the 1-nitropyrene in these three Japanese cities that was derived from diesel exhaust. And you can see that in this particular example, greater than 99 percent of the ambient nitropyrene was found to be derived from diesel exhaust.

It's worth noting that in this case, the penetrance of diesel vehicles for private motor vehicles is much higher than typically what we see in the U.S. And so these numbers may be a little higher than what we might expect to see in the is U.S. But nevertheless, it's an important observation.

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DR. SIMPSON: So the example that I'm showing you now is much more recent from data that was collected in 2008-2009 in the Duwamish Valley in Seattle. This is -- this part of Seattle is just downtown from the major urban

core, and has the distinction of having some of the worst air quality in the Seattle area.

For this study, samples were collected at one of the local agency's air quality monitoring sites using the standard federal reference method PM2.5 sampler running on the typical one- and six-day schedule.

We measured particle mass on those filters. And then we did the analysis for 1-nitropyrene, and have highlighted three important observations from the study. So the first is that the daily 1-nitropyrene was highly significantly associated with counts for heavy trucks on the highway that was running adjacent to the air monitoring site. So we specifically put pressure sensors into the highway, so that we could count cars versus trucks throughout this period. And trucks were highly associated with the nitropyrene. Cars were not.

For the more the weekday to weekend ratio of nitropyrene paralleled the equivalent ratio for heavy trucks weekday versus weekend. Importantly, PM2.5 did not show a weekday/weekend effect, and so the -- the weekday/weekend changes in 1-nitropyrene are not associated with traffic-derived pollution, in general, or the bulk of fine particles. It was much more specific for heavy trucks.

And then the final point, we conducted a positive

matrix factorization source apportionment analysis, looking at -- based on metal content and the particles, as well as various organic components. From that analysis, we identified seven source contributions to the PM2.5 mass. One of those source contributions was a diesel related feature, and that was the only one that was significantly associated with the daily measurements of the 1-nitropyrene. And you can see that the correlation coefficient was pretty high for that association.

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DR. SIMPSON: So this slide is even more recent data. So these were samples that were collected, again in that -- in Seattle's Duwamish Valley. These ones, however, were collected with a very intensive particle sampling campaign that took place in to low socioeconomic neighborhoods in the Duwamish Valley.

And the idea here was to measure various different markers of traffic and truck pollution, and then use a land-use regression approach to try and predict the spatial variation in those compounds. And so the colored map here is the spatial prediction of 1-nitropyrene from the land-use regression model. The red represents high levels of 1-nitropyrene and the green is low levels.

And then on the right side of the figure you see the variables that ended up being significant in the

land-use regression model. And three of four of those variables are truck -- are diesel related. So the top one is the proximity to railroads and railyards in the area. Those are the -- the emissions -- the truck emissions prediction is also part of that land-use regression model.

And then the bottom line item, this log mobile black carbon, we actually had folks driving around with a black carbon monitor in the vehicle. And those mobile measurements were fit into the model as well. And that was a significant predictor of the 1-nitropyrene.

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DR. SIMPSON: So the take-home message from those three examples is that despite the questions about variability and chemistry of diesel exhaust and changing emissions of diesel exhaust, and these recent measurements to try and get at the association between 1-nitropyrene and trucks or -- and sources of diesel exhaust in ambient samples in an American city, we see pretty strong associations between diesel features and the 1-nitropyrene.

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DR. SIMPSON: So the next couple of slides I'm changing tack a little bit. And here looking, not at ambient levels, so much as looking at personal exposures. So this is data from a study that is ongoing. These

samples were collected back in February and June of this year at an underground metal -- non-metal mine in the middle part of the U.S.

Each of the bars represents the single work shift measure of 1-nitropyrene on one of the workers that we were studying. I should point out that in this particular mine, they're not using old technology diesel, they're using biodiesel blend for the fuel, and they're using diesel particulate filters to control the particle levels in the mine. And, in fact, this mine is actually well below the MSHA standards. So it's a mine where the exposures, at least from an occupational sense, are being really well controlled.

And yet, we see a very broad range of exposures experienced by the workers in this case, ranging from almost 1000 picogram per cubic meter for the -- for some of the occupations that were in parts of the mine that were less well ventilated going down on the right-hand side to levels that are on the order of 1 or 2 picograms per cubic meter, which is much closer to ambient concentrations.

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DR. SIMPSON: So, for comparison, we can look at nitropyrene data from some of the other groups of people that were studied. So in this chart, we're looking at --

each bar on the chart represents the median value for each of those different populations. The ones that are highlighted in red are sites that were associated with close proximity to traffic. And the sites in blue were less obviously associated with high levels of diesel traffic.

So Shenyang is one of those relatively newly industrialized cities in northern China. And you can see that the highest concentrations that we observed were -- the red bar there was actually the on-shift concentrations -- or on-shift exposures experienced by taxi drivers in Shenyang.

The blue bar, which is I think it was about five-fold lower than the red bar, is the off-shift exposure that are experienced by those taxi drivers when they're at home in the evening. Moving across, we see the concentrations were much lower than Shenyang, but certainly measurable at the Duwamish site in Seattle that I presented for you earlier. And very similar levels were also detected at the San Ysidro border crossing between San Diego and Tijuana.

As part of that study, we also measured personal exposures in residents from Tijuana, which were somewhat lower than the concentrations at the border, but were much higher than the concentrations or the exposures

experienced by residents of San Ysidro and South San Diego.

So the gestalt of those data is that the trend in nitropyrene concentration parallels what you would expect based on either proximity to sources of diesel emissions, so proximity to traffic. And furthermore, that the trend parallels what we would expect based on the varying range of emissions controls. So in California we have pretty good emissions controls. The diesel exhaust -- or the 1-nitropyrene concentrations are much lower compared to Mexico or compared to Shenyang.

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DR. SIMPSON: Okay. So that kind of sets up the motivation that 1-nitropyrene -- or that there's reasonable evidence that 1-nitropyrene can serve as a marker both for group and for individual exposures to diesel exhaust. So now I want to look at some of the evidence we have that the metabolites, the urinary metabolites, of 1-nitropyrene can also serve as markers of diesel exhaust exposure.

So the slide in front of you illustrates the analytical scheme that's used in my laboratory to measure these 1-nitropyrene metabolites. A couple of points to highlight, the metabolite concentrations are typically very low, and so we start with a large urine volume.

We're starting with 100 ml of urine. And we have to use sophisticated sample clean-up and tandem mass spectrometry techniques in order to achieve the desired specificity and sensitivity.

This procedure may initially seem daunting from a population monitoring point of view. I would point out that there are opportunities to automate the sample clean-up steps, so the blue rayon extraction and the alumina solid phase extraction.

And the new generation mass spectrometry instruments have inherently higher sensitivity than the instrument that I use, which is about 10 years old now. And so the new instrumentation should allow one to get away with much smaller urine volumes on the order of 10 ml or so. And, in fact, for some of the studies that we've done we've been able to use 10 ml if of urine.

The clean-up procedures itself is, in fact, not inherently more complex than some of the assays that are used by CDC, and I imagine by your own laboratories for urine analysis of things like some of the persistent organic pollutants, for example.

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DR. SIMPSON: Okay. So this slide shows the metabolic pathways for 1-nitropyrene in mammals. At the top of the slide, you see 1-nitropyrene itself and then a

series of different metabolites. In vivo studies in rats suggested that the hydroxy-nitropyrene and the hydroxy-N-acetylaminopyrene, two of the boxes that are highlighted in yellow, are the most abundant compounds in urine. And certainly those are the most abundant metabolites that my lab has detected in the samples that we've looked at.

However, I also want to -- I'm going talk a little bit about aminopyrene as well. That's the compound that's highlighted in blue on the right. And there is data from both animal and human studies to indicate that this compound also may be an important metabolite of nitropyrene, and a potential useful biomarker.

I'll say right up front that the assay that I used does not, in fact, or would not be able to detect that compound if it were present in the samples. So the fact that I don't present any data from it from my lab shouldn't be taken to mean that the compound was not there.

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DR. SIMPSON: Okay. So here's data from a series of studies that were done showing urinary metabolite levels in various population. The highest levels were detected in subjects from Peru who drove diesel vehicles. So these were highly occupationally exposed subjects. The

samples in red were the taxi drivers from Shenyang. And they're somewhat lower than the Peru levels, but certainly much higher than the samples that are shown in green, which were university students from Kanazawa in Japan.

So the trend shows that metabolite levels are highest in the groups that we would expect to have the highest levels of exposure to diesel exhaust, so that's promising.

But what we're really interested in knowing is whether the biomarker is a useful predictor of individual level exposure to diesel exhaust and to nitropyrene.

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DR. SIMPSON: And so to address that question together with Dr. Jenny Quintana and Dr. Galaviz in the audience here, we conducted a study that examined nitropyrene exposures for a group of subjects who live in Tijuana in Mexico and commute to work daily on foot. So they're commuting to work in south San Diego, crossing the border every day, which involves standing in this pedestrian lineup that's illustrated on the slide here, oftentimes for several hours and very close proximity to diesel buses and other vehicle traffic.

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DR. SIMPSON: So on this slide, we compare urinary metabolite levels for two different nitropyrene

metabolites compared to personal 1-nitropyrene exposures that were measured on those subjects. So the two compounds are the 8-hydroxy-nitropyrene on the left and the acetylated derivative on the right.

There's a significant -- well, there's definitely a dose response association that's statistically significant for the acetylated compound, not quite statistically significant for the non-acetylated compound.

The data in this case were not creatinine adjusted, because many of the samples we were not able to get creatinine measurements on. However, for the subset of samples that we did do the creatinine correction, it didn't materially change the results of the analysis.

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DR. SIMPSON: I said I'd describe a little bit some of the data for 1-aminopyrene. So there are at least two studies that have looked at this as a potential biomarker of diesel exhaust in humans. The study by Seidel was a group of underground minors. And they were able to detect levels in the low nanogram per liter range for underground miners.

More recently, Laumbach and colleagues conducted a controlled exposure study, in which human volunteers were exposed to diesel exhaust for a period of one hour. And that diesel exhaust contained about three nanograms

per cubic meter of nitropyrene.

There was a 10-fold increase in the urinary aminopyrene for those subjects after the diesel exhaust exposure compared to before diesel exhaust exposure. So both of these studies indicated that -- the possibility that 1-aminopyrene could be a useful biomarker for diesel exhaust exposure. When one does a back-of-the-envelope calculation for the mass balance on the Laumbach study, that indicated that the amount excreted was approximately equal to the amount inhaled. So that's a plausible finding with the qualifier that most of the inhaled dose would have to be excreted in the urine as 1-aminopyrene. And, in fact, the animal data suggests that that's probably not the case, that it's probably only 10 percent or so would end up as the urinary metabolite.

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DR. SIMPSON: Okay. So wrapping up, the data that I've indicated -- or data that I've shown you indicates that 1-nitropyrene is associated with -- increased levels of 1-nitropyrene exposure are associated with increased levels of urinary metabolites both at the group and at the individual level.

However, there's some key questions that we still need to answer. We don't have a good handle on what period of exposure is represented by a spot urine sample.

We've indicated that there does exist this relationship between the inhaled nitropyrene and the urine levels, but in the data I shared, that relationship was somewhat noisy, and we need to do a better job of determining how strong that relationship is, and what other factors, including potentially inter individual differences in metabolism might be -- we might be able to understand that would account for some of that variation in exposure.

And we don't have a good handle on whether dietary sources of 1-nitropyrene are important, in terms of this urinary biomarker. The data that I've shown indicates that we can see an association with inhalation exposure, but once you're dealing with the community level, then we have to consider whether diet may be important.

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DR. SIMPSON: And I just put this slide up to kind of reemphasize that point, that when one is considering a biomarker as an indicator of exposure, it's very important that we have a clear idea about what time window of exposure is represented by the specific biological sample we analyze.

Metabolites in urine tend to have a relatively short half-life. And one of the effects of having a short half-life is that one would have to make more frequent

repeat measures on an individual subject in order to adequately capture what the typical exposure level of that subject is. Or to put another way, for compounds that have a short biological half-life, the daily urinary concentration is going to be moving up and down relatively substantially in concert with daily variations of exposure. And when you're concerned about a biomarker for a chronic exposure and association with chronic disease endpoints, you're less interested in the day-to-day variation and more interested in the long-term exposure.

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DR. SIMPSON: And I think that slide summarizes really largely what I said. So in summary, I believe these metabolites continue to show promise as biomarkers of exposure to diesel exhaust, but I do believe that there still exists some important knowledge gaps that we need to answer before we can conclude definitively that these compounds are reliable, quantitative metrics of exposure to ambient levels of diesel exhaust in urban environments here in the U.S.

Thank you.

CHAIRPERSON LUDERER: Thank you very much, Dr. Simpson. That was a really interesting and very informative talk.

We have a few minutes now for some Panel

questions for Dr. Simpson?

Dr. Quintana.

PANEL MEMBER QUINTANA: I just had more of a comment that I think it's going back to our presentation from a previous speaker about the half-life. And if it's a short half-life, I believe the previous speaker said, it might not be appropriate for community monitoring, but I think we have to think about the stability of the exposure. So if you live in a community that has polluted air and you have -- your windows are open all time because you don't have air conditioning, even with a short half-life, the exposure can be stable enough that a single measure can be quite informative.

And we see that with cotinine, which is a metabolite of nicotine with a 17-hour half life. And with a 17-hour half-life, you would think it would not be that informative. But, in fact, people's behaviors are so stable in relation to their exposure to secondhand smoke, it is an extremely reliable marker.

So I think we have to think about if it's a very infrequent exposure or if it's a very consistent one before we completely throw out something with a short half-life, I guess.

DR. SIMPSON: Exactly. So I think that's an important point. And the additional point is that one can

always -- by collecting more than a single sample, one can compensate for the fact that short half-lives, what goes along with that, is day-to-day variation.

CHAIRPERSON LUDERER: Dr. Fiehn.

PANEL MEMBER FIEHN: I do have a question on this interesting study from Tijuana where you, if I understand it correctly, looked at the exposure that says log personal 1 NP, because it says NP exposure. And then you looked at the urinary 8OHNP levels. And -- right? You know --

DR. SIMPSON: Yeah.

PANEL MEMBER FIEHN: This was exposure, so this is like four or five orders of magnitude of difference in exposures, because it's a log scale. And many people who were -- had high exposure did not actually show the metabolite in urine.

This comes back to the question I had before, is urine the right matrix to look at to measure, you know, the actual exposure, because of differences in PK/PD kinetics and so on?

Because here you say it's weak to moderate associations, but in your exclusion -- in your conclusions you'd say -- strongly suggest that urinary NP metabolites increase. You know, I don't get it from that figure to the conclusions as strong association, whereas your data

shows it's weak.

DR. SIMPSON: So just to clarify, the summary statement -- in general, the sum of all of the data that I have presented, that was what I was referring to when that shows a strong relationship. So absolutely when you have a very broad range of exposures, as we saw with those bar charts where I'd included exposures in Peru and Shenyang, as well as exposures in the U.S. In that case, the meta-analysis, if you look, shows a very strong association with exposure.

You're right that in the case of the Tijuana cohort, which is a relatively small cohort of subjects, that data by itself doesn't show a very strong relationship. And that's where -- that's one of the areas where we need to do a little bit more research in order to understand what other factors are adding to this variability. I don't think it's just an artifact of the fact that it's a urine sample as opposed to a blood sample.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: I just had a couple of things to say. And I should, I guess, disclose that I've traded some emails with Dr. Simpson about some ideas for research projects.

But one thing to consider in terms of going

forward, if we were to look at this biomarker, in California, we have some interesting locations where there could be very close together disparate exposures that could be kind of a place to perhaps validate this biomarker. For example, in the Bay Area we have 580, Interstate 580 and Interstate 880, which are roughly parallel to each other, one with very heavy truck traffic and near a number of ports and airports, whereas 580 does not have truck traffic -- does not have major commercial traffic -- truck traffic, and within a relatively small area.

So there could be an opportunity there. It's kind of a natural experiment to look at emissions and exposures. And then there may be, and I know our group has some, and there may be other groups too that have stored samples, that may be valid. For example, we have daily urine samples collected from East Oakland residents that are geocoded to an individual address. We have similar samples in a less developed area in the Salinas Valley.

And there might be some opportunity to use our, or other, stored samples to perhaps examine things like within and between subject variability and see if there's a link, for example, to traffic density information.

So there might be some opportunities to do some

relatively easy studies that might help with validation, so -- and that was not intended to promote our group.

(Laughter.)

DR. SIMPSON: Well, I think, in general, the availability of stored specimens and biobanks gives us the opportunity to kind of look forward and look back, and see to what extent the changes in engine regulations and emission technologies and so on really have changed exposures experienced by people in the communities.

And if we can demonstrate that that has occurred, that's a very important thing to highlight as a success, both for the -- not just for the Biomonitoring Program itself, but for engine emissions policies and the State in general.

CHAIRPERSON LUDERER: Do -- we have some time for questions from audience members, if there are any questions right now, that audience members have for Dr. Simpson?

And if not, I know we have some public comments, which -- all right. So thank you again Dr. Simpson.

So we have one public comment. This is from Joe Suchecki from the Engine Manufacturers Association.

(Thereupon an overhead presentation was presented as follows.)

MR. SUCHECKI: Yes. Thank you. I'm Joe Suchecki

with the Truck and Engine Manufacturers Association. And we're the trade association that represents the manufacturers of all the engines that are involved in all the forms of diesel here in California. And our major goal is working with EPA and ARB on all the emissions regulations.

And so I wanted to just I think inform some of the questions that actually have come up by the Panel to talk about a couple things that you should consider in your decisions or deliberations. One is that is we've heard characterization of diesel emissions have fundamentally changed due to new emissions control technology. And that has resulted in very large measurable emissions reductions in southern California more than 70 percent in just six years. And those will continue to decrease as our new technology engines replace the other engines.

The other issue is on the biomarkers. Both 2007, 2010 engine technology, which was a major regulatory development in new technology, they essentially have eliminated PAHs and nitro-PAHs compounds that may be considered. As an example, in the 1-nitropyrene that you're talking about, emissions information indicate that 2010 engines there's none detected being emitted from those engines.

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MR. SUCHECKI: And just to go into a little bit more detail, mass emissions have changed dramatically. Again, the 2004 is before the technology. 2007, 2010 later mass emissions less than 99 percent. Particle number emissions also decreased by 90 percent. And then on the pie chart there, it just shows you the ratios. And not only has the amount been decreased by 99 percent, but the composition has changed, so that most of diesel exhaust now is sulfates.

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MR. SUCHECKI: Some pertinent information from South Coast AQMD, their MATES IV report has just come out. I just wanted to show these numbers that they are measuring very large reductions in the last six years in south coast at all locations of measured diesel PM. You can see that the average now is below 1 microgram per cubic meter. And those results indicate greater than 70 percent reduction.

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MR. SUCHECKI: Even in the ports areas which they measures, that has decreased from 10.9 micrograms down to 2.9 micrograms per cubic meter. So rather great reductions.

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MR. SUCHECKI: What the emissions profile has done is it's increased or decreased everything across the board. And here is just a chart that shows you for the 2010 engines, which is our model that's out there now, even greater reductions from 2007. We've had actually 99 percent reductions in -- 92-99 percent reductions in most of the compounds relative to the 2007 engines. And as you can see, again compared to the pre-technology, the 2004 engines, nearly a hundred percent reduction, especially in like your PAHs and N-PAHs. Elemental carbon has been reduced, so there's essentially no carbon left in the emissions.

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MR. SUCHECKI: As an example of what you're talking about, here are some data. And these data on the emissions are from a study conducted with -- by the Health Effects Institute and the Coordinating Research Council funded by EMA and the Department of Energy with the cooperation and involvement of the ARB and EPA, the ACES, Advance Collaborative Emission Study, was a long-term looking at both emissions from 2007/2010, and then also looking at health effects. And I'm not going to report on the -- they did a rat -- you know, three-year rat bioassay study to see if indeed the new emissions produce any tumors plus a lot of other stuff.

But for those emissions from 2010 engines, before 2007, as you see, there was a lot of 1-nitropyrene, 630 nanograms per horsepower. 2007, we had dropped to 20, and now for the 2010 engines, it's, you know, below the detection levels in the test.

So I just wanted to put that in front of you. EMA does not have any position as to, you know, whether you should or shouldn't go ahead with this, but there significant emission changes that are measurable. The emissions are constantly changing. As was said, the fuels are constantly changing.

And the other issue is, you know, California has done the best job on this obviously in the world. So what you look at here in California is really different than what kind of emissions you have in Europe, what kind of emissions you have in Japan, in Mexico. Those countries actually are way behind us in terms of emissions control technology.

So I think there's a lot of things to consider here. And just one more question -- or comment. I'll -- you know, there was a couple questions before. What is diesel emissions?

Well, from a regulatory standpoint, diesel emissions is anything that comes from an internal combustion engine that is a compression ignition engine

without a spark plug. So whether it's biodiesel or MTBE -- you know, the -- whatever -- the fuel that was mentioned, the DTE or diesel fuel or any combination, it's all diesel emissions, regardless of what the fuel is. So that's what you really need to be concerned about and what's being measured here.

So I'd be happy to answer any questions you have about any of the data. And I think my slides that were -- that I that had, there's a little bit more additional information in there. So I'd be happy to answer any questions you may have.

CHAIRPERSON LUDERER: Thank you very much. Do we have some questions from Panel members?

Dr. Quintana and then Dr. Bradman.

PANEL MEMBER QUINTANA: Hi. I think that these new engines really are a great public health measure, and the emission reductions are impressive. And I'm very proud of living in California that's made such huge public health strides.

But from a community point of view, and actually I just want to take a minute to say to the first speaker, Dr. Marty, you showed a map of Southern California that didn't include San Diego. And I just want to remind people that Southern California goes all the way down to the border.

(Laughter.)

PANEL MEMBER QUINTANA: And so in my local communities, even though ambient concentrations are expected to decrease quite a bit, we still see extremely fine scale spatial variation being much higher right next to a source, and then declining, even if a neighborhood in a general area still remains high relative to other areas. And so I think there still may be situations where people are exposed perhaps in an area where they don't have the funds to move as quickly to some of the new technologies, especially the border regions, or where a transport may occur from Mexico. So I think there may be still very local scale exposures, perhaps not captured in these ambient scale reductions.

And then I have a question for you, which may be -- this is beyond what you had to present. But you present reductions in these different classes of chemicals, but you don't have it normalized to say micrograms of black carbon or milligrams -- or micrograms of PM matter. And so do you have evidence of differential reductions between these things or are they basically a consequence of getting the particles -- getting the soot out of the air, I guess.

MR. SUCHECKI: I can find an answer to that. I don't think that any of the testing is done in terms of,

you know, nanograms per microgram of black carbon or what that relationship is, so they're all measured individually during these test cycles that were run.

But actually, frankly, we're down to pretty much zero black carbon. So there isn't going to be -- that's essentially all eliminated from diesel exhaust for these new engines, so -- and the PM, as I said, is mostly sulfates. So, you know, I'm not sure -- it turns -- it's not reported or I think tested in terms of its relationship to PM. That's essentially gone. And then, you know, whatever is -- whatever the measurement is that they can get to the finest level is what's reported now. Is that what you were asking about?

PANEL MEMBER QUINTANA: I think there's some data I've seen. I just can't recall about, I guess, differential reduction in pollutants. And the previous speaker, Dr. Marty, mentioned ultrafine particles, some data on increased emissions with filters and things like that. So I was just interested.

MR. SUCHECKI: Yeah. And on that issue, that -- the issue of increased ultrafine emissions has pretty much been resolved. The data that we have now, and that ARB has, you know, shows that we're reducing the number of particles as well by about 90 percent or more. So there was a case where there was some discussion about whether

when you regenerate those filters -- essentially these filters collect all the soot, and then they essentially burn them up. And there is a question about whether when you regenerate, do you increase the number of particles.

And so when you have that small regeneration event, there is an increase in the number of fine particles released, but it's essentially non-carbonaceous, so it's probably mostly sulfate particles. And then also it's still a lot lower by orders of magnitude then what the -- what an uncontrolled diesel engine or would even a 2007 engine would be.

And in terms of the differential, I think numbers show it's pretty much across the board. I gave that one chart where everything is reduced 80 to 99 percent, you know, throughout the whole spectrum of everything that was tested for, and they tested for lots of things. And this -- you know, for, you know, you folks on the Panel or the staff, the database that this information comes from, HEI has made it available to the public. So it's available through the Coordinating Research Council organization who did the testing, and coordinated the testing part for the emissions. And so all that data is available for everybody to look at on their website, and it has the whole database of all the tests and what was done. So we can -- you know, if there's more interest in

looking into that, that can be -- that's readily available.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: First, I just want to reiterate Dr. Quintana's comments that this really is impressive. And I think, as an industry, there's, you know, a reason for a lot of pride there in addressing this important public health issue.

I had some questions that are kind of basic here. In terms of the data where you present on this slide where you show reductions in 1-nitropyrene emissions for 2007 was a cutoff, and then 2010. What proportion of engines in the fleet adopt these technologies? And I assume -- I maybe ignorant here -- that, you know, are they phased in and/or are they retrofits, and so what is the time frame? And it could be that, you know, biomonitoring might be an excellent way to validate these changes.

MR. SUCHECKI: Yeah. Sure. Yeah. Obviously, as you know, and one of the issues is that diesel engines are very durable, and, you know, our companies do too good of a job in making them reliable, and so they last for a long time. So obviously, these are being phased in. As new technology comes in in 2007, there was a wave of those coming out. And generally, it's going to be the large fleets -- you know, your FedEx and your Schneider

Transportation and whatever, who are buying new trucks who get the new technology.

And then -- so 2007 will actually be eight years now that we've had those on the road. 2010 was the next level where we had not only the PM reductions from the filters, but also the NOx reductions, which added selective catalytic reduction to the system. Those have been out now for -- this is going to be five years. And there is -- pretty much in the rest of the country, there is a gradual, a very gradual, introduction to those.

Happy to say that in the last three years after the recession, where we had very little turnover, people are buying new trucks again. So we're getting more and more. Here, in California, you have the added advantage of all the work that's being done by ARB in terms of retrofits. You have in-use retrofit laws that are requiring, you know, a lot of fleets. You have the Carl Moyer Program giving out lots of money for everybody to do that. You have South Coast working on, you know, cleaning up the ports and whatever.

So, in terms of how -- what percentage there is in California, that -- I do not know that number. In fact, I kind of anticipated that question and called ARB to see if they had a number, and they didn't get back to me yet, so -- but I would, you know, suggest that the

number is relatively large. Maybe, you know, 50-60 percent in California, as opposed to other locations, which is, you know, maybe 30 percent or 40 percent.

And obviously, you know, those pre-2007 engines now are getting to the point where they're going to be -- those trucks/vehicles are going to be retired, because they are, even for diesels, they're getting old and they're going to be replaced with new ones. So it's a continuing journey as to what percentage is out there.

But, you know, in response to the question about what communities are taking advantage of that? You know, I think it's -- because it's California, it's all over the board. But obviously, the small individual owner of a truck who's probably got not the resources to buy a new one, because obviously all this technology makes them a lots more expensive. You know, there is probably in a number of communities where there's still a lot of old diesel trucks running around.

So in that case, you are going to have, you know, certain levels. But as South Coast data looks, you know, now, they're saying -- wherever they measured, they're getting 70 percent reductions in ambient diesel levels, with the caveat, of course, that no one is really sure, because there's no good way to actually measure diesel emissions. But with all -- the trend is in the right

direction, regardless of what the actual numbers is. Since they're doing the same method, you know, the trends are going way down.

CHAIRPERSON LUDERER: Did we have -- I was going -- we have one more public comment. Was there another question?

Dr. Quintana. Oh, two.

PANEL MEMBER McKONE: That's a very interesting topic. So you talked about the actual combustion, right, which is the truck and that -- or the engine, and that has a long life time, right, so it takes a long --

MR. SUCHECKI: Right.

PANEL MEMBER McKONE: And then the post-combustion, which actually we can deploy fairly quickly, because that's add on, you don't have to get a new truck.

The one thing is, is there any -- you didn't talk much about the role of the fuel. I mean, you can also augment the fuel, and that also could make a change. Although, that's a bit -- I don't know how much your association has looked at that as a role or even --

MR. SUCHECKI: Well, we have --

PANEL MEMBER McKONE: -- that the fuel might damage -- I mean, there's this concern that the fuel actually could damage the engine or the post-combustion

process.

MR. SUCHECKI: Right. Right.

PANEL MEMBER McKONE: So we have to be careful. I mean, sometimes people are working against each other. They're trying to come up with a new fuel, but the new fuel is not compatible.

MR. SUCHECKI: Right. So let me -- so in terms of most of the things that we're concerned about, the toxic elements here, you know, the PM and all the PAHs and whatever, you know, these diesel particulate filters are designed to reduce that to like, you know, 99 percent or whatever. And that doesn't -- it doesn't make a difference in what the fuel is.

So that process is going to take place, regardless of whether it's 100 percent biodiesel or 100 percent renewable diesel or diesel fuel. That process occurs regardless of the fuel. The advantage of biodiesel is in pre-2007 engines, without the filters, that does reduce the amount of air toxics from the combustion process, so that's that.

And then the other issue is, at which actually the ARB is working on right now, is biodiesel increases NOx emissions, even in engines -- because with filters. So if you use biodiesel, you actually find an increase in NOx emissions. So that's a concern with pre-2007 and 2007

engines. However, now that we have 2010 with the SCR system, those SCR systems take care of all the NOx issues, so we don't have to worry about that anymore.

We still have to worry about a lot of biodiesel, because there is some problems with too much biodiesel, and the engines don't necessarily -- certain wear and tear is increased, so -- but the emissions are -- with 2010, everything is pretty much taken care of, regardless of fuel.

PANEL MEMBER McKONE: Thank you.

CHAIRPERSON LUDERER: Dr. Quintana one quick question.

MR. SUCHECKI: Thank you very much.

CHAIRPERSON LUDERER: All right. We have another public commenter. And this is Chris Ruehl from the California Air Resources Board.

(Thereupon an overhead presentation was presented as follows.)

DR. RUEHL: Thank you. My name is Chris Ruehl from the California Air Resources Board. And at ARB, we have conducted experiments measuring nitro-PAH emissions from heavy-duty diesel vehicles with advanced aftertreatment. And we've also searched the literature for similar studies. So up on this chart you can see who at all has studied. It was done by ARB. And the rest

were all the other studies I've been able to find that report on this particular class of compounds from heavy-duty diesel vehicles.

Nitro-PAHs are generally more difficult to quantify than PAHs without functional groups. And as you can see, we've only found eight studies in literature, including ours that report their emission factors from heavy-duty diesel vehicles.

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DR. RUEHL: And so here are the results from our literature review. You can see that the emissions of these compounds vary widely from 0.02 to 73,000 nanograms per mile. So in other words, that's over six orders of magnitude.

And both gas phase and particle phase nitro-PAHs have been found in the exhaust of diesel engines, even those equipped with advanced aftertreatment. And the gas phase nitro-PAH emissions were two to three orders of magnitude higher than the particle-phase nitro-PAH emissions. And you can see this by comparing the left and the right side of that plot.

To summarize, engines equipped with filters but no selective catalytic reduction generally had reduced particle-phase nitro-PAHs. But gas phase nitro-PAH emissions were either lower, higher, or similar for these

engines depending on the study.

Now, engines equipped both with filters and selective catalytic reduction had lower particle phase and lower gas phase nitro-PAH emissions. And that was seen in the one study measuring both phases for SCR. And that's already been mentioned. That's the ACES Phase 2 study.

And so that -- yeah, I just had that as just the result of the literature review that we have done. And if there are any questions, I can answer them.

CHAIRPERSON LUDERER: Dr. Alexeeff.

DIRECTOR ALEXEEFF: Yeah. Thank you for your comments. I just have a question in understanding this specific slide. Under the Heeb study you have low oxygen and high oxygen, is that the case?

DR. RUEHL: I'm sorry. I should -- that's -- they have filters. One was characterized as a low oxidation potential filter, one was characterized as a high oxidation potential filter. But that should probably say that those are vehicles that have been equipped with filters but not with SCR.

DIRECTOR ALEXEEFF: Okay. And the thing that I was wondering about is looking at there was a large difference in terms of nitropyrene, which is one of the chemicals of discussion. And I didn't know if you had any thoughts about why the type of filter I guess is going to

be affecting that?

DR. RUEHL: Well, nitropyrene I would say it's -- you know, it's a four ring PAH, so it's a relatively large nitro-PAH. It's going to be found primarily in the particle phase. And as far as what comes out of the tailpipe after the aftertreatment, it's really a complicated system where you have both creation and destruction of these compounds. And so the one study that I have found that did compare a low oxidation potential and a high oxidation potential filter, I think it's just -- even a slight change to that delicate balance could result in certain compounds having, you know, a large difference in their emission factors.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: Hi. I'll ask you the question I was going to ask the last speaker, but probably you're an even better person to ask. I know I've heard the answer to this, but I can't recall. What is the status of out-of-state trucks that come into California to deliver things in terms of are they required at all to meet California standards or not in terms of trucks crossing the border into California versus other border states? Do they meet State standards or do they meet federal standards under NAFTA?

DR. RUEHL: I know that we are looking into that.

That's an area of concern for us is, you know, to what extent out-of-state vehicles, which do not meet California standards, are present in the State. And, you know, unfortunately, that's as far as I know the answer to your question.

John Collins is also from ARB.

DR. COLLINS: My name is John Collins. I'm with the Air Resources Board. We're not the proper staff to be asking questions about --

MS. HOOVER: Can you speak into the mic?

DR. COLLINS: Sorry. My name is John Collins. I'm with the Air Resources Board also. And we looked into this nitro-PAH, but we're not the best staff to answer the questions about fleet transitions. But I can say that the out-of-state trucks are required to meet California standards. They're required to meet our retrofit rule, which accelerates the transition from the older technology trucks to the newer technology trucks, but it depends on the amount of mileage or the amount of -- the percent of operation that occurs in California.

But if there's a substantial amount, and they're based in say Arizona or anywhere within the country, and they spend any significant amount of time in California, they must meet California regulations.

PANEL MEMBER QUINTANA: I just asked because

whenever I see -- well, I see a lot of trucks belching soot on the road, and that's not even legal in California at all I think to have visible emissions. And I -- but I often see out-of-state or out-of-country trucks. And I was just curious about how much that regulation might be actually enforced too?

DR. COLLINS: Right. Well, there is a phase-in period. The new trucks hopefully don't do that. Some of the older trucks do. And there is a complicated phase-in regulation, the truck and bus rule or the retrofit rule, that requires fleets to upgrade their equipment. But there are exceptions to that or the phase-in is delayed if the fleet is very small, or there are regions say in far Northern California where they're exempt from the rule, because they don't have the same NOx and PM issues.

And there are also trucks that come in the State that are not compliant and our Enforcement Division is working to, you know, improve compliance. There are trucks that just simply don't do the required retrofits, and then there are maintenance issues, there are failures. And again, when there's a new technology, it takes time for all the kinks to be worked out.

So there are -- for example, a DPF may fail completely, and then you would see black smoke. And there are definitely instances of operators removing the filters

because they were affecting performance. It's a whole variety of things. And our Enforcement Division is actively working on that, and the Research Division is actively trying to study the extent of the problem, and the divisions that develop rules are looking at it very closely as well as warranty issues.

So it's an ongoing process, and we're aware it's not perfect, but it is improving. It's a tremendous improvement over what it was a few years ago. And your ability to spot smokes with -- trucks with black smoke should decrease rapidly in the future.

(Laughter.)

PANEL MEMBER QUINTANA: Thank you for stepping up.

CHAIRPERSON LUDERER: Yeah. Thank you very much both of you. And Dr. Simpson I believe had some additional comments.

DR. SIMPSON: Yeah. I just wanted to try and answer Dr. Quintana's question earlier about the relative change in nitropyrene per gram of particles with newer versus not so new diesel engines. So our experience at UW, we do controlled human exposures to diesel exhaust there. We were using a 2002 model Cummins light-truck diesel engines. We replaced that recently with a 2010 model Yanmar generator.

Certainly, the particle levels from those two devices, the Yanmar was much lower. However, per gram of particles, the nitropyrene was only about two-fold lower for the 2010 diesel generator versus the 2002 engine.

With the 2010 generator, there was about a 10-fold difference in nitropyrene per gram of particles for lower versus high load. So the low load had much more nitropyrene than the high load. So that was to try and directly answer your question about changes in the chemistry.

A question that I might pose, is there -- to ask the question the extent to which these sophisticated exhaust treatment technologies continue to operate as designed throughout the life of the vehicle. And in asking that question, I'm thinking of the MSHA regulation for coal mines. So at some point, MSHA decided that it was not possible for them to meet the measured diesel exhaust particles in a coal mine and separate the diesel exhaust from the coal dust.

So their approach to regulation was to source test the engines, and only certify engine -- diesel engines that met specific emissions requirements for use in the mine, and so that's the regulation.

As part of that regulation, I believe is ongoing retesting of the engines to ensure that they continue to

meet the emission design specifications as they age and continue to get used. And so that's -- I'm not sure how that applies to on-road engines or what the process would be for verifying them?

CHAIRPERSON LUDERER: Thank you very much.

Do we have any other Panel questions of the speakers?

We now would like to do -- have to, I think, devote our last minutes that we have for this topic for more Panel discussion regarding what the Panel members kind of feelings are about moving ahead with potentially measuring nitropyrene metabolites, what types of studies might be those that the Panel members would recommend that if they did think that was a good idea, that the Program should perhaps attempt to move forward with. We're wondering if the Panel members have thoughts about those questions.

Dr. McKone.

PANEL MEMBER McKONE: I'm a theorist, so bear with me.

I was thinking, you know, when you hear all of this, I always try to conceive of what would be -- if we could have anything we wanted, I mean, the most ideal thing, what I think we would ask for is if somebody had a device or a way of measuring disease burden per million

diesel engine miles driven, right? I mean, that would be the perfect metric and we could watch it change, right?

I mean, we don't know how to measure this. It could be disease burden expressed in something like disability adjusted life years. But I always do -- I mean, my purpose in coming to like the theoretically perfect would be well we're never going to get to the theoretically perfect, but what's the -- I mean, the imperfect that we can get that gets closest to that.

So I guess the way to frame this is, you know, in an ideal world what we'd like to see is something that we can associate with a number of -- because it's really diesel engine, not -- or diesel exhaust, but what we care about is the operation of diesel engines and how many million miles, or whatever the metric is, are driven, and then we want to see the disease burden go down, because there's a pretty strong characterization that there is disease burden associated. So less is better, but what we don't see is how all of these different activities -- we know they bring down the emissions on tests, but we don't know how much the disease burden goes down in the population.

We use biomonitoring, if it's effective, to really watch what's happening in the population as technology or some other aspect changes. And so I guess

the question I would pose then, is what we're looking at, the step in the right direction to get at what we would love to have in an ideal world? And this is the real world, is this in the right direction?

I don't know if I can answer it, but that's -- I think that would help us get a handle on it. And so to end it, still, the real tricky question is we're looking at something that we're really looking at the operation of diesel engines. So this is a little more complicated than looking at, you know, the use of toothpaste or home products or something where it's fairly specific. We're now looking at something that is classified by the operation or it's a technology and the operation of the technology. And we would like a marker for what might be related to disease burden from the operation of that technology in a dispersed way.

CHAIRPERSON LUDERER: So then really to paraphrase your question is do we know that the markers that we've been discussing are directly associated with disease burden?

PANEL MEMBER McKONE: So I would ask it this way. One is, are they related to disease burden, which, you know, think we could -- maybe could make a case to that? And then how are they related to the operation of diesel engines, if that's the correct term? If that's what we're

trying to measure is the burden associated with that, we need a marker, we need a measure, of exposure that's on the pathway from the operation -- the source being the operation of diesel engines, the endpoint or outcome being some burden of disease in the California population, and what's in the middle, right? I think that's -- what the best thing to put in the middle?

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: I guess before the operation of diesel engines operating a very clean diesel engine is very different than operating a dirty one. So I think it gets back to what is bad in diesel exhaust, because that's what we actually want to measure the reduction by having this new technology and showing public health gains.

And we have a lot of toxicologists sitting here. I don't think Dr. Simpson presented anything about the toxicity of 1-nitropyrene per se, but I believe that it's one of the more mutagenic compounds in diesel exhaust, more mutagenic than the parent PAHs, which are somewhat probably mutagenic themselves.

So I know some studies -- and I know people here know much more than I do, these toxicologists sitting here. For example, if you take diesel particulate matter and you extract it with a more polar solvent, which gets

the oxy and nitro-PAHs out, I believe, it is more mutagenic when dumped on human cells for example.

So I think, in that sense, some of these compounds, and 1-nitropyrene being one of a class of compounds, may represent some of the most mutagenic parts, in my understanding. I'd love to hear from a toxicologist about this.

DR. MARTY: This is Melanie Marty. So just, yes, the 1-nitropyrene is a carcinogen. And the nitro-PAHs tend to be more mutagenic. I might add though that we -- there are tens of thousands of compounds in diesel engine exhaust, most of which have not been characterized. So it's easy to look under the lamppost, but it's harder to say whether -- you know, how much can you attribute to each nitro-PAH versus other compounds in the diesel exhaust?

I also want to throw in another thing to think about. If you look at mortality from particulate matter, from cardiovascular events, it overshadows, by a long shot, the number of lung cancer deaths. So that's another thing to think about in terms of the health outcome and what you want to put in between the operation of the machine and the health outcome.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: Just for discussion, I

know, Dr. McKone, you were focusing on burden of disease. But I'm thinking back to some of the criteria we had for recommending priorities for biomonitoring, and some of the things we came up with with California to actually elevate them from designated to a priority status was one exposures that were unique in California, and then whether or not there was necessarily an associated risk.

We know there's associated risk with diesel exposure. I mean, that's clear from all the literature. We don't know how well 1-nitropyrene, you know, represents that risk, because it comes from many sources, both chemical, and as Dr. Marty just pointed out, from particulate matter and things like that. We can't -- we don't, at this point, at least have biomonitor for particulate matter. Although, there may be there's some inflammatory enzyme we can look at.

But we do have the situation in California where there's been tremendous policy debate over many years. There's been a lot of gnashing of teeth around that. If you go on the web, you can see lots of examples of that. KillCARB.com is one of them.

(Laughter.)

PANEL MEMBER BRADMAN: You know, there's been some consensus in a response by the industry that's been very -- apparently very successful, so -- which is maybe

unique in California. So maybe there's an opportunity here to support biomonitoring that would, in the same way flame retardant biomonitoring might show declining trends, there might be an opportunity here to show declining trends too. And even if we can't necessarily link it to a specific burden of disease, we can probably link it to reduced risk.

And given that we prioritized diesel as a target for monitoring, do we want to, you know, maintain that essentially elevated priority for this compound, and therefore, you know, recommend that we do some research to see perhaps, with existing samples, and I -- I don't know necessarily benefit from that. But there may be some opportunity to do even some very simple validation studies that might help us make a decision about whether we want to do more wide biomonitoring with perhaps the sample set we've already collected. You know, right now we have a building biobank within the Program and that could perhaps answer some questions.

Given how much money and, like I said, gnashing of teeth has gone into the development of this policy, it might be a real service that can be provided by the Program to demonstrate some change.

CHAIRPERSON LUDERER: And just to -- I think I'd like to pick up on that just to -- there's maybe a sense

of urgency, given that there's these rapid changes that are happening in the engines and the design of the engines that are coming on the market, that this might be the time to do that rather quickly, so that we can actually capture the effects, I think, from what you were -- you know, I think that that goes along with what you were saying, so we can capture the changes that are happening and demonstrate benefit.

Dr. McKone and Dr. Alexeeff.

PANEL MEMBER McKONE: I think this is an important point, because I want to pick up on what Dr. Bradman said and then you followed up on, which is without -- I don't think it's been emphasized is that I think there's uncertainty about what's the best biomarker, but there's strong agreement that we should do what we can to monitor what's happening.

And so the priority may not be to find the biomarker so much as to make sure we have an adequate sample set in our archive, right, so that when we do find a good biomarker, we can see the change that took place.

I mean I wish right now there were -- when you hear about the change -- we're in the middle of a dramatic change. Wouldn't it be great to be seeing it happening? Well, we might not have the biomarkers to do that, but we should be able to go out and strategically pick areas

where we want to get samples, and make sure that we save those samples so that when we can look, we can look backwards, right.

I mean, to me, this is a -- it's like a recommendation not to go ahead with a -- well, to go ahead and do the research to find a biomarker, but to make sure we have the samples to apply it to, that don't start the day the biomarker is available, but actually allow us to look backwards in time to see what happened during this transition period.

CHAIRPERSON LUDERER: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Thanks. I just wanted to ask Dr. McKone what you would collect? Because I agree with you, and it also occurs to me, you know, are you collecting 10 ml of urine, or are you collecting 100 ml of urine, or are you collecting blood to get adducts? You know, how do we know in -- I very much agree with the premise of like let's not let this window pass us by. I'm very intrigued by the idea of watching this transformation happen.

Some of that may be possible because of archived samples, depending on what biomarker, you know, winds up being used. But if -- if we were to recommend going out and collecting samples, we need to have some notion of what type of marker would best fit that sample or we might

collect the wrong sample.

PANEL MEMBER McKONE: That's a good point. I guess maybe the way to augment this would be to say at least identify groups that have -- are collecting samples to see which ones we want to make sure they don't -- you know, that they retain some amount of those samples that might be useful for this. Yeah. No, I think we would have to anticipate it's going to be blood or urine. That's mainly what we worked with.

And, you know, how much, that's -- we won't know that, but hopefully we can identify where some of those repositories are and make sure that they might allocate or set aside some amount.

CHAIRPERSON LUDERER: Dr. Fiehn.

PANEL MEMBER FIEHN: That's a very interesting and compelling discussion. So we had in other rounds already discussed like the opportunity to work with health care providers like Kaiser who actually collect blood. So, you know, for other purposes, but, you know, if there would be a way to extend such types of cooperations and collaborations, that would be beneficial for not only nitro-PAHs, but also for many of the pollutants that would be worthwhile to, you know, monitor.

And, you know, secondly, I, you know, would like to say I guess to your question of what to collect, I was

a bit underwhelmed today about the urinary markers. Also, you know, because of the PK/PD issues and, you know, interindividuality of people. Whereas in blood, you would hope that there would be more consistent data. Also, you know, there are more -- a little more persistent in the blood than in the urine. In terms of the actual compounds, you know, to be analyzed, of course, that would need to be closely reviewed. But it appears to be very clear that, you know, there is ranges of nitro-PAHs, and just to focus on one particular compound alone might not be as robust as to a panel of compounds, say 10. I don't say a thousand. You know, something that is still manageable. But most likely, these kinds of panels would be more informative and more robust as any single one.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: I think that there's some data -- I'm sure Dr. Simpson could comment more, but getting back to our first speaker's comment about secondary reactions in the atmosphere, that again we should, you know, if you do choose a panel, I think have to think about atmospheric chemistry if it's to do with diesel that you don't have compounds that have a different profile if the air is being aged a lot versus not, or if it's sunny or isn't sunny.

So I think that given that filter, a panel is

always nice. But just choosing them without regard to atmospheric chemistry might introduce more air than it helps solve I guess.

CHAIRPERSON LUDERER: And kind of following up on that, I mean, certainly we're already measuring PAH -- hydroxylated-PAHs, which could be metabolites of diesel, but they're also produced by many other reactions. So I mean, I think that that is an issue, but that might be something that the Program could potentially explore is relationships between maybe some of these biomarkers that we're already measuring, such as the hydroxylated-PAHs and potential diesel biomarkers. I mean, I think that might be an interesting thing that could be done with archived samples, where they have already been measured -- measuring the hydroxylated PAHs.

Dr. Alexeeff, I forget you had a question.

DIRECTOR ALEXEEFF: That's okay. I benefited by hearing some of the other comments, because what my comment was -- or question to the Panel was whether or not it would be of value to measure nitropyrene or nitropyrene -- or nitro-PAHs to track those over time to see if the burden of that is reduced.

Now, there could be -- the question is, you know, what -- what are the other sources, and that's something that could be looked into, and how much do they

contribute? Are they huge contributions of sources, and if so, maybe that's something also to look at -- look into. I mean, it could be cigarette smoke, could be wood smoke, could be some other things.

But that might be something -- because I guess at least the information we discussed here that nitro-PAHs are highly mutagenic, are carcinogenic. So maybe there's some value in reducing that, of which diesel exhaust is one contributor. So could we see nitro-PAHs go down over time, particularly nitropyrene.

CHAIRPERSON LUDERER: Dr. McKone.

PANEL MEMBER McKONE: Actually, I mean building on what I said, I was going to make the suggestion that we should pick markers to work with, right? I mean, you don't want to just stand around and wait for the perfect marker to come in the door.

But the other comment I made about, you know, looking at the -- making sure we have the appropriate samples, and I guess I would say, when you aren't certain that you have the right markers, you don't want to say, no, I'm not going to collect anything. I'm going to wait. But you also don't want to put all of your weight on -- or all of your emphasis on thinking these are the right markers. That's all we're ever going to get.

And so I think the idea is to proceed in sort of

a research mode with the markers we have, but also make sure there's enough flexibility in the collection and storage and the way it proceeds, so that there's -- the door is open to finding other markers, and there will be enough archived or saved samples that you could go back and test different hypothesis, because I think this is -- this is still in kind of a mixed research mode, but we also feel compelled to start doing something, because we're missing the opportunity to see some sort of rapid change is taking place. I hope that makes sense.

CHAIRPERSON LUDERER: Dr. Marty.

DR. MARTY: I just wanted to comment on the concept of combining nitro-PAHs. So there's a few issues in there, the specificity issue is a big one, in part because nitration of PAHs is a common atmospheric reaction. It's dependent on the nitrate radicals present and a bunch of other factors. So I don't know what you'd be measuring, if you combined all nitro-PAHs.

Dr. Simpson pointed out that 1-nitropyrene is a pretty good marker for diesel engines, because it doesn't have a lot of other sources, so that's something that needs to be balanced out. And then, the CARB folks pointed out that the ratio of nitro-PAHs to particulate matter is changing with the diesel engines. So that's sort of another complication with trying to just measure

nitro-PAHs as the exposure marker.

Just throwing that out there.

CHAIRPERSON LUDERER: Thank you.

Dr. Simpson.

DR. SIMPSON: Yeah. I just wanted to make a couple of points on the analytical challenges, both for blood and urine. In general, I really like the potential of the exposomics approach, where instead of picking one compound and focusing all your attention on that, you measure a broad swath of compounds, and then you can use -- you have a more statistical path to look at patterns and things like that.

The challenge, at least with these nitropyrene metabolites has been because they're present in such really low concentrations, we've had to do pretty sophisticated enrichment clean-up steps. And the more processing of the sample that you do to get rid of the extraneous material so that you can measure the thing you want to, the more you lose the ability to look broadly at a real wide range of chemicals. So there's certainly a tradeoff to be aware of there.

I also wanted to make a comment on the potential of blood as a biomarker. When I started in this field a little over 10 years ago now, blood was really where I wanted to be, because I recognize that that is going to be

a longer term biomarker. It gets around a lot of the concerns about -- potential concerns about temporal variability and things like that.

As I looked at the literature, it was not clear what the right target to identify in blood was. There were some papers that said it was hydroxylated derivatives of the nitropyrene. And there were other papers that said it was -- that it was a reactive amine group. And there was not a consistency in the literature. And so as a young investigator at that time, I wasn't willing to take the risk of picking something that -- and being wrong about it.

In the 10 or 12 years since then, that picture has not changed at all. So I guess the take-home message is that the urinary metabolites are not perfect, but we know a heck of a lot more about them, and I think have a lot more confidence in those than anything else that doesn't preclude us from looking at other compounds, but in terms of the state of the science where we are now, it was definitely a lot more behind urinary metabolites than there are protein adducts or hemoglobin adducts or things like that.

CHAIRPERSON LUDERER: Thank you.

Dr. She, did you have a comment, or question?

DR. SHE: This question might be more for

Professor Simpson. I just wanted to check the reference, it's one part of the 1-nitropyrenes and also you measure the metabolite 1-nitropyrenes and then that's a question should we measure both of them, metabolite of 1-nitropyrene, 1-nitropyrene plus what Dr. Ulrike Luderer mentioned combined with hydroxy-PAH? Is that a reasonable approach? Also, look at the structure of 1-nitropyrene is a bigger ring, four rings. So I assume that it'll go to the feces beyond the urine excretion. So what's the possibility, if not combined with the blood, is the feces combined with urine matrix.

DR. SIMPSON: So maybe the second question first. The animal studies clearly have -- clearly show that most of the metabolites are excreted via the bile into the feces. So if one were willing to use that as the biological matrix you analyze, that might get around the sensitivity problem somewhat, in that there's going to be more material in the feces and the urine. But I think it creates far more issues from a sample collection point of view. And in reality, there are metabolites in both urine and feces. And so therefore, there's probably not a good -- not a compelling rationale to spend a lot of effort looking at the feces.

And your first question you asked about the possibility of a screening analysis. And certainly, there

are recent papers where people are looking at parent PAHs hydroxylated-PAHs, PAH quinones, all -- looking at all of those in urine samples.

As I said for the nitropyrene metabolites, their concentrations are so low that those screening assays don't yet seem to have the required sensitivity. But that said, the instrumentation has -- continues to improve dramatically and it may well be that that would be feasible within a pretty short period of time.

CHAIRPERSON LUDERER: Thank you. Again, I wanted to check to see whether there are any other public comments?

None via email.

DR. COLLINS: It's not a public comment. It's just further discussion.

CHAIRPERSON LUDERER: Sure. Please, go ahead.

DR. COLLINS: I feel like the group is focusing very much on how best -- sorry. This is John Collins from ARB. I feel your group is focusing very much on how to best measure exposure to nitro-PAH, what metabolites to collect, how to do it.

But if you do that, what is nitro-PAH a marker for? It's no longer in the same relationship to diesel PM that it used to be. So the relationship between nitro-PAH and the health endpoints that goes by diesel PM are going

to change or just the PM mass itself is going to change. So to consider a marker for PM mass exposure, you won't be able to make that connection, unless you also measure nitro-PAH in diesel emissions, which is not commonly done right now. So I would just suggest that you consider that to be incorporated in your program in some way.

CHAIRPERSON LUDERER: Thank you.

Dr. Quintana, did you have a -- oh, I thought you were -- actually, we need to wrap-up this discussion. So we don't have any other public comments.

So should I summarize at this point, just kind of focus on few points there?

MS. HOOVER: I just wanted to circle back to just the simpler -- you know, I mean, everyone knows it's not perfect, but I still want to circle back to the things that Dr. Bradman were pointing to, which is yes it's changed now, but there -- I mean, we did some prep work for this meeting. We talked to a lot of people, and no it's not perfect, but it's still the best thing so far that anybody has managed to find.

So with Dr. Bradman's idea of looking at our archived samples and trying to take a look at has there been a change over time, that would be one possible simpler approach, as a start, you know, not perfect, not ideal. The other thing we had thrown in there we didn't

have time to talk about, but you could start with something like that, and then you could look at a more sophisticated design where you try to use other measures. You know, using nonspecific markers of genotoxicity in the blood, using measurements -- you know, air measurements of some sort, so there's different approaches if we actually took it to a study. The idea of comparing like 580 to 880, I think there's a lot of options for, you know, teasing this out in some way, but we have to start somewhere.

So the question is, just this very simple question is do you recommend -- I mean, given lack of resources and lack of staff, so that has to be incorporated in there, should the lab look into potentially measuring nitropyrene metabolites in urine? Like just simple as that. Get a reading from the Panel on is that worth doing, or not, I would say, and then we can close the discussion.

CHAIRPERSON LUDERER: Dr. McKone, would you like to comment?

PANEL MEMBER McKONE: No, I think in a way I know there's a lot of complicated discussion, but I think that's what -- if I can speak for everybody, I think that's what we're going to with -- but with your latter point, which is we're not really comfortable saying, okay,

go with this and be happy with it. We're saying go with this to learn, but also make sure the door is open and that you're not excluding all these other research opportunities. So as long you can go forward with a nitro-PAH metabolite and build some adjunct or complementary programs in monitoring other aspects, that will strengthen or allow you to test some hypotheses, I think that's what we were -- I mean, that's what all of the discussion is about is the -- is the other side of this, which is the downsides and the but I don't think anyone said don't go that direction. We just said go that direction with some opportunities to move and some flexibility.

CHAIRPERSON LUDERER: I mean, I agree. I think that that was my impression of the consensus too

Dr. Bradman.

PANEL MEMBER BRADMAN: Yes. Sara, would you like us to vote?

(Laughter.)

MS. HOOVER: No, I don't want you to vote. I think that my sum up with -- you know, I mean, we all recognize the issues, the problems that have been pointed out, but that we have this kind of more complicated idea in mind, pending resources. So I think we -- I think we've summed it up adequately, and I think we could stop

here and call for a break, unless anybody wanted to say a one minute last thing.

CHAIRPERSON LUDERER: Dr. Fiehn.

PANEL MEMBER FIEHN: Thank you. I think you have raised an important point that is priorities, in terms of workloads and resources. And I don't think we have really discussed this. So if we, you know, would like to have one thing, what does it mean for other things we also would like to do? Yeah, right?

So that is, of course, a decision that, you know, you can only do one thing at a time, and not everything. So I would not be able or comfortable to make this decision at this point.

MS. HOOVER: Well, yeah, thank you for that. That's an important point. And our next item is going to talk about some, you know, agenda priorities for the SGP next year. And Dr. DiBartolomeis also mentioned we're doing -- we've been doing a lot of priority setting, given our reduced resources.

So we're not really making that decision here that we're placing this necessarily as a higher priority of other things, but just if we have the opportunity, if we have the resources, this would be a reasonable thing to try as a first step. That's sort of how I would frame it, not that -- not that you saying that here, we'd then say

oh, we're going to drop something else. No, we haven't -- we wouldn't be making that choice here.

CHAIRPERSON LUDERER: Okay. I think it's time for a break. So we will be taking -- and thank everyone for the very interesting presentations and the great discussion we had. And we will take a 15-minute break, returning at quarter to 4:00.

(Off record: 3:29 PM)

(Thereupon a recess was taken.)

(On record: 3:44 PM)

CHAIRPERSON LUDERER: We're going to be getting started again soon, so if folks could go ahead and sit down.

All right. I'd like to welcome everyone back from the break and call the meeting back to order.

So the next agenda time, as we've already mentioned, is a presentation on the SGP meeting agenda planning for 2015 from Laurel Plummer -- Dr. Laurel Plummer, who is Associate Toxicologist in the Safer Alternatives Assessment and Biomonitoring Section of OEHHA.

I wanted to let the Panel and the audience know that the purpose of this item is to briefly review some possible agenda items and chemical selection topics. And these items have been identified by Program staff from

previous SGP recommendations and input, as well as based on recent Program activities.

And the Program also welcomes suggestions from the public and the Panel on additional possible agenda topics or chemical selection items.

So, Dr. Plummer.

(Thereupon an overhead presentation was Presented as follows.)

DR. PLUMMER: Okay. Thank you so much. This is the last item -- or almost -- second to last item of the day, the last presentation. And I'm happy to just present to you guys some ideas that we've pulled from, as Ulrike said, past meetings. You know, we create a summary and post it on the web of each meeting, so it serves as a really great way to go back and sort of see, you know, what has the Panel brought up as things of interest for future discussion.

So it's just a quick little presentation here.

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DR. PLUMMER: So the purpose is just to review some topics, so we can discuss at our three meetings next year. And just I have up there the three dates that we've determined for our meetings, March 13th, July 16th both in Oakland, and then about a year from now back here in Sacramento on the 18th.

And so we just created this presentation to summarize some ideas and get input from the Panel, and also the public on these suggestions and also for them -- for everyone to provide their own -- some other ideas.

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DR. PLUMMER: All right. So as usual, we have the topic where we'll have general Program and laboratory updates from leads of the laboratories and Program lead, Michael DiBartolomeis as well. And then we'd like to also propose, you know, continuing to share Program findings, including biomonitoring results as they become available, but also taking it a step further and synthesizing the data, and, you know, sharing conclusions from Program studies so far. And that's been requested as sort of a next step to help the Panel provide further input on recommendations based on findings from studies so far. So sort of take things to the next step.

As requested, and also as part -- as one of the important mandates for Biomonitoring California, we want to continue to circle back to a discussion of how the current Program efforts and studies can inform our -- you know, the mandate of approximating a statewide representative sample. And we talked a little bit about that today, as being, you know, a big priority for the Program.

So two examples of studies where we are, you know, taking efforts to look at a more representative sample are the Genetic Disease Screening Program collaboration, which Michael talked about a bit earlier, and then also the BEST study, particularly the study that's going on right now, which is the Expanded BEST, which includes more participants and, you know, a greater number of individuals in that study.

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DR. PLUMMER: Then we'd like to continue the discussion today and also from a meeting where Dr. Fiehn spoke last -- this past year, 2014, on screening for unknowns; continue to discuss related issues. Quite a few things came up today, and I think that would be definitely a worthwhile topic to get input on from the Panel to continue to share results and findings and get input like that.

And then also, as proposed at a previous meeting, we could have a discussion on measuring cotinine and other tobacco biomarkers as part of the Biomonitoring California Program.

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DR. PLUMMER: Okay. And then sort of the other aspect, you know, we always talk about is how important results return materials are. And our Program continues

to put quite a bit of effort into this -- this part of our program. And in addition to creating the materials, we also have taken some efforts to evaluate how useful and effective these materials are in conveying both the findings and also the meaning of the findings to our participants. So we could invite a guest speaker to talk about the evaluation of the MIEEP results return materials. And we could also have Program staff report back on evaluation of the BEST results return materials as well.

And then as many of you know, we launched our new website followed by a new results database this past year as well. And as part of our ongoing, you know, work on that website is we're -- you know, we follow the website use and other measures of public engagement, such as, you know, how many times does someone open a listserv, and you know, when is the best time to send these notes, and what people find most interesting, and who -- you know, who is coming to the site as well. So that's something we could report back on as well.

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DR. PLUMMER: And then these -- this -- the three bullets here refer to some issues and discussions that we had at the last meeting in July, where we talked about a lot of consumer product-related -- issues related to

chemicals in consumer products. So we could have a, you know, follow-up discussion on the results from -- after the Program has a chance to systematically review consumer product chemicals currently on the Biomonitoring California list. You know, we could report back on that -- our findings from that.

There also was some interest expressed, both at the July meeting and also at previous meetings, to hear more about the really interesting HERMOSA intervention study, and, you know, we'd be happy to have a guest speaker on sort of summarizing the findings from that study -- or that collaboration with the labs.

And then also, as you know, we had some really great guest speakers and some really great discussion at the July meeting. And so we really want to follow up on some of these collaborations looking at some overlap between efforts that the Safer Consumer Products Program and Safe Cosmetics Program are looking at. And Myrto alluded to some of those, the overlap with the flame retardants, I think, during her talk earlier today.

So those are kind of the general, you know, Program/laboratory updates.

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DR. PLUMMER: The next sort of general topic is looking at what we might want to consider as priorities

for chemical selection items for next year as well. We have already planned to look at phthalates as a class. They're currently only listed -- or currently only designated as the ones that are listed and not the all-encompassing class.

We also plan to look at perfluorinated chemicals as a class. And this is taking a new approach with the nomenclature, which Myrto talked about earlier, which is the PFASs. You can see the full long name down there in the -- with the asterisk. So that will allow us to really look at a more broad class of fluorinated substances, and consider a broader grouping.

So other items being tracked -- this is -- sorry, I forgot to say it's for potential designation, looking at other classes of musks possibly alicyclic and macrocyclic, which were part of a screen that was presented earlier this year. And then also some of the selected pesticides from, I believe it's the -- one of the DPR lists of top pesticides in use. These four listed here were screened in a presentation and presented to the Panel last year too. So those can be possible options for chemical selection for next year as well under potential designated chemicals.

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DR. PLUMMER: Under potential priority chemicals,

you have two -- you have a couple materials in your folders that can help you make some suggestions and recommendations on potential priority chemicals. So in October 2014, we released an updated list of designated chemicals, and it's posted on the website. So that's -- there's a copy of that included in your packet, as well as a list of the priority chemicals from June of this year as well.

And so we actually created, at the recommendation of the Panel from a previous meeting, an excerpt of the designated to make the -- to make it easier for the Panel to see, okay, what chemicals are designated, but are not yet priority. And there's some footnotes and things on that that can help inform your decisions -- or your recommendations on that.

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DR. PLUMMER: Then lastly, as many of you know, we sort of begin our whole chemical collection process with a preliminary screen. We started doing this, I think, with organotins in the beginning, and then looking at bisphenol related chemicals, bisphenol substitute -- BPA substitutes. So this is sort of our list pulled from summaries and, you know, last -- recent year's meetings of groups -- chemical groups that have come up as of interest to the Panel.

So phthalate substitutes, there's actually one phthalate alternative added to the designated list. And this is based on CDC's addition to their program. And then the bisphenol A substitute screen that we presented, included chemicals that were not structurally p,p´-bisphenols. And so there's, you know, quite a few other things that were already screened and we could expand on that.

UV stabilizers and filters, benzophenone-3 would be a part of that group. And at a previous meeting, and you'll see this as a note on your excerpt of the designated list, that it was a recommendation to come back and look at benzophenone-3 as part of a group, kind of a function -- or a use category.

Fragrance compounds we talked about this past year. There's, you know, other ones we could look into. And then disinfectants, antimicrobials, any additional environmental phenols, and then other chemicals in consumer products that people might be interested in.

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DR. PLUMMER: And so at this point I just will open it up to kind of gauge the Panel's interest on these various topics that I presented, you know, related to laboratory or Program topics, and also chemical selection items that you might be interested in. And we always

welcome additional suggestions that you might have.

Thank you.

CHAIRPERSON LUDERER: Thank you very much, Dr. Plummer. Any questions from Panel members to start us off, or comments?

DR. PLUMMER: Actually, can I just say one more thing?

CHAIRPERSON LUDERER: Yes.

DR. PLUMMER: Another item in your packet is just basically the slides that I presented in a Word document form, so you can scan it more easily.

CHAIRPERSON LUDERER: Okay. If we don't have any questions, there is a public comment, and I can read that and then we can get into the discussion. Did we get any additional public comments other than the one that you gave me or --

MS. DUNN: (Shakes head.)

CHAIRPERSON LUDERER: Okay. All right. And so this one does relate to this topic of agenda for --

MS. DUNN: Dr. Luderer, I'm sorry, there is one more.

CHAIRPERSON LUDERER: There is one more?

MS. DUNN: Yeah.

CHAIRPERSON LUDERER: I'll go ahead. So this was a comment that came in by email and it relates to the

comments that was made this morning by Sharyle Patton from Commonweal about VOCs. So I'm going to read just -- it's a rather long letter, so I'm going to read some of the main comments that are somewhat different from what was presented this morning.

So this is from Global Community Monitor, GCM, Empowering Communities from Ruth Breech, who's the Program Director.

And it's regarding VOCs to be prioritized within the Biomonitoring California Program. Global Community Monitor requests that the Science Guidance Panel recommend prioritizing volatile organic compounds, VOCs, within the list of chemicals of concern under consideration for exposure monitoring by the Biomonitoring California Program.

We understand the limitation of Biomonitoring California activities due to funding constraints, but consider VOCs to be of serious concern, given the number of likely exposure pathways experienced by Californians, and the number of well documented linkages between VOCs and disease.

Of special concern are exposures to workers in gas production activities. A recent NIOSH study indicates that some workers are exposed well beyond safety standards to benzene, a chemical closely linked to leukemia. Most

Californians are exposed daily to mixtures of VOCs. Measuring levels of VOCs in Californians will help guide public health policies in limiting exposures.

Having the capacity to compare average levels of exposure for most Californians to levels found in populations clustered around gas production activities will be critically important in ensuring such activities are appropriately regulated to ensure safety.

We ask you to recommend prioritizing VOCs as chemicals of great concern to the Biomonitoring California Program, and request that you support the Program in developing the appropriate assays for detection and measurement in the appropriate human biospecimen's urine and in moving forward to measure levels of these chemicals in Californians as soon as possible.

We request that you recommend particular urgency in moving forward in testing populations living near sites that are currently or will in the future be developed for the purpose of gas and oil extraction.

I have to thank Ms. Breech for that comment. And then we have another?

MS. DUNN: Two more.

CHAIRPERSON LUDERER: Two more.

Okay. So we have a comment from Veena Singla, Natural Resources Defense Council.

DR. SINGLA: Thank you. Veena Singla with the Natural Resources Defense Council. I wanted to express my support for the listing of phthalates and parent polyfluorinated substances, both as classes for the designated chemicals list.

The market for these chemicals is constantly changing, and many different phthalates and fluorinated chemicals are widely used in products. So I think it's important to have the flexibility to monitor for these as the use is shifting to new and different chemicals.

On the topic of new priority chemicals, I wanted to recommend carbamate insecticides and pyrethroid pesticides. Carbamates did shows significant use near California public schools in the recent report from the California Environmental Health Tracking Program. And pyrethroid pesticides are common replacements for organophosphate pesticides, both in agriculture and in indoors use. Data from NHANES indicates widespread exposure, and that children have higher exposure as compared to adults.

A recent study from UC Davis found that for pregnant women in California, residential proximity to agriculture pyrethroid pesticide applications increased risks for autism and developmental delays in their children.

On the possible agenda topics for 2015, I'd like to suggest for consideration discussion of pesticide biomonitoring to follow-up on the California Environmental Health Tracking Program report of pesticide use near public schools. And the information in that report could be used to inform biomonitoring studies, such as particular pesticides to monitor for and geographic locations of at-risk populations.

Thank you.

CHAIRPERSON LUDERER: And thank you very much for that input.

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

MS. BUERMEYER: Thank you very much. Nancy Buermeyer with the Breast Cancer Fund.

I just want to start by saying just generally congratulations to the staff and the Program and the Panel for all the incredible work. This is a really, really interesting program today. And as always, the amount of work done is very impressive.

I also wanted to comment on the chemical categories of both designated and priority. I want to strongly support adding phthalates as a class of chemicals to look at. You know, we've done a lot of work on phthalates as an organization as the Breast Cancer Fund

looking at the them in toys.

And there was a recent report that came out from the Consumer Product Safety Commission Chronic Hazard Advisory Panel that looked at a number of phthalates, many of which are on your list, but not all of which are on your list. And as concern for the different phthalates grows, and the use pattern changes, it would be really great for the Program to have the flexibility to be nimble about moving from a particular phthalate to a different phthalate. So we think that would be a really great move to make that a family chemical group, as opposed to just the individual chemicals.

In terms of chemicals we'd like to see moved from the designated list to the priority list, they would include the acrylamide set, and then to throw our hat into the ring on the VOCs. It's something we strongly support in addition to the comment you just read, and to Commonweal and Sharyle -- and the comment that Sharyle made.

And we'd also like to have you look at adding to the designated list, aromatic amines(a-meens) -- amines(aw-meens). And then you talked a little bit about the functional group of UV filters. We would support adding those to the designated list of environmental phenols as well.

And also, we'd like to have you take a look at or think about nitrosamines. We actually look at chemicals from two different perspectives, one from breast cancer, as the Breast Cancer Fund, obviously, but we also -- we also run the Campaign for Safe Cosmetics, so we look at a lot of chemicals that are of concern in cosmetics. And some of these chemicals, like nitrosamines, are things that we want to do some more work at looking at. And having this kind of a biomonitoring ability would be really, really helpful.

So thanks, again, for all your great work and for allowing me to comment. Thanks.

CHAIRPERSON LUDERER: Thank you for the comments.

So we now have time for Panel discussion. I think we've already heard from several of the public commenters the -- there seems to be a lot of interest in including phthalates as a class in the -- among members of the public on the designated chemicals list as well as there was several comments supporting VOCs. And I -- that might be a point where we could start for discussion, but we could also start with any of the other topics as well too.

Dr. Quintana.

PANEL MEMBER QUINTANA: I want to say I agree with the public comments, and just wanted to add in

something Dr. Bradman said earlier, which was that children were definitely of interest to the Panel, and the public for a lot of these exposures, especially those that might come through house dust for example, or kind of some really age-specific exposures. And so along with your comment about phthalates in toys, I know that this genetic screening program and the maternal serum has an opportunity to get at some pregnant women exposures.

But we're still kind of, I think, missing that young children as a target for our Program, which kind of ties into some of these exposures. And if there's any comment on that, I'd like to hear it.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: Okay. Well, I just -- just echoing what you echoed in terms of what I said, yeah. I mean, I think in general that it's important that we do start doing work looking at those populations. I remember talking about this with Michael at the very beginning of the Program, a number of years ago. And, you know, there are -- there is some work obviously going on with that with the MIEEP study.

But I think opportunities to look at exposures that affect young children should be a priority. And, you know, many of the studies that are -- that have gone on, for example, there were some measurements of phthalates in

our CHAMACOS samples, and -- but I would just echo, yes, I mean, you're echoing my comment earlier, that you know we should make that population a priority, especially for some of these things like indoor exposures. We heard about VOCs, phthalates and things like occur in dust. Flame retardants are very prevalent in dust, and probably that's the main exposure pathway of non-dietary ingestion.

So I know I would like to make that a priority.

CHAIRPERSON LUDERER: And I think we heard this morning too that dust is also a source of exposure to the per- and polyfluorinated compounds. And that was another item that was on the list that I think would also be important from that regard as well in consumer products exposures.

Any other?

PANEL MEMBER BRADMAN: I have a kind of a procedure question. In terms of the agenda today, are we supposed to be making decisions today about priority versus designated chemicals or these are suggestions that we should -- that will be considered in a future meetings.

CHAIRPERSON LUDERER: Things to consider.

PANEL MEMBER BRADMAN: Okay.

CHAIRPERSON LUDERER: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Thanks. I just wanted to weigh in in support, in general, of this consideration

of moving towards some chemical classes where they're relevant, because of, as the public commenters have mentioned, the issue of substitution, I think, is true in several of these categories. And we're able to cover so much more if we can just have the category on the designated list, and even some of these categories it looks like need to move to the priority list. I think that's true for phthalates. Although, I'm a little bit shaky on the history still.

But, in general, I think that's -- given what we know about how quickly the industry changes from one chemical to another, based on, you know, regulatory signals, but also just technical availability, I think moving toward having classes would be really useful.

CHAIRPERSON LUDERER: Thank you.

Any other comments from Panel members?

One question. One of your possible topics was for moving towards a representative statewide sample. And you were talking about the -- using the BEST population, as well as the Genetic Disease Screening Program. And one thing when we -- when the Pilot BEST was first being developed, one question that I had raised at that time - and I was wondering this might be a time to consider that again - would be to do maybe an Expanded Expanded BEST, if it's possible, to collaborate somehow with Southern

California Kaiser, so that it would be more of a statewide type of program. I don't know whether that's possible, but that might be something to consider.

Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: I have a question. Every time VOCs come up, which they have several times today, partly because of the public comment, we acknowledge the difficulty -- you know, some of the technical difficulties of biomonitoring for VOCs. And I just wanted to know if maybe we could hear a little bit more - if now isn't the time, that's okay - but when we take up this topic of how big a challenge that poses to the laboratory staff, what it would entail in terms of development of new methods versus just sort of redirecting the workflow, so that we have a better sense of the challenges that we would be asking the Program to undertake, if we were to suggest moving forward with VOCs?

PANEL MEMBER FIEHN: Yeah.

CHAIRPERSON LUDERER: Dr. Fiehn.

PANEL MEMBER FIEHN: Sorry. Yeah, that is also the same direction that I would like to see. So instead of just discussing about priority itself by chemical class, but also, you know, what it entails, because usually we go one class at a time. We discuss, say, the musks, or we discuss antimicrobial, you know,

disinfectants or so.

And we then say, yes, these are important compounds. There's clear toxicity. There's clear exposures. So, yes, they should be designated. But now that we, you know, want to put things onto priority lists, we need to put it all into perspectives, right, doability, sample availability, costs maybe, technical availability, and maybe also exposures that we know, and toxicities that we know. So it's a really difficult task, I think. And so we need time for that. That's what I wanted to say in terms of -- you know, in order to do it right, you need to have some time.

CHAIRPERSON LUDERER: Well, and I think that's one of the things that the Program is asking us. Of those designated chemicals that are not yet priority chemicals, which ones would we like to set aside time during the subsequent meetings that we're going to have next year to really get into, you know, the nitty-gritty, you know, the feasibility of biomonitoring, et cetera, for those either individual chemicals or groups of chemicals.

And we haven't really said much about that yet. Do Panel members have particular groups of chemicals or chemicals on the designated list that they'd like to make a case for bringing forward next year?

Dr. Quintana.

PANEL MEMBER QUINTANA: Well, are you talking about the designated list?

CHAIRPERSON LUDERER: Move to the priority list.

PANEL MEMBER QUINTANA: Well -- okay. I'll shelve my comment. It was about cotinine and other tobacco biomarkers, which is not suitable at this -- okay.

Well, one of the items on here was discussing if we should measure biomarkers of tobacco smoke exposure, secondhand smoke exposure, as well as primary smoking. And I would like to have a more expanded discussion of that, because that exposure to secondhand smoke has many of the compounds that we are measuring in people's blood and urine. And I think it would help greatly with interpreting our results with communicating our results to participants, in terms of identifying sources, and also telling them how this exposure might relate to secondhand smoke, for example, in terms of magnitude. And I think it's something I'd like to have a further discussion about on our Panel.

And that cotinine is a metabolite of nicotine, I should say. And it's on the priority list, is that correct? Yeah. And also NNAL is a metabolite of tobacco specific nitrosamine and that is also on the list and is currently measured by NHANES.

CHAIRPERSON LUDERER: Dr. Kavanaugh-Lynch.

PANEL MEMBER KAVANAUGH-LYNCH: I wanted to follow on that comment and see if there are possibilities of -- in looking at measuring cotinine and other tobacco exposure is -- or nicotine exposure is to think creatively about whether there are ways to distinguish cigarette exposure from e-cigarette exposure and whether we need to add things to be able to do that? Because I think if we're going to do one, we should do both.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: Yeah. So I agree the e-cigarette is a very big exposure that's suddenly coming to our population in California. But cotinine again is a metabolite of nicotine, which is present in e-cigarettes. The tobacco-specific nitrosamines are less present in that liquid and so would be more specific to tobacco smoke. And one of them is currently measured. It may not be the only biomarker or the best biomarker, but it is currently on the list.

But I guess my comment was more to ask for time to discuss this further at future meetings, I mean, if it's something that we should pursue.

PANEL MEMBER KAVANAUGH-LYNCH: I agree. You know, I was just trying to add -- something to add to that topic when we discuss it.

CHAIRPERSON LUDERER: Dr. Kavanaugh-Lyncgh.

PANEL MEMBER KAVANAUGH-LYNCH: On an unrelated, I would also be very interested in the possibility we were -- of discussing collaborations with Safer Cosmetics Program and other State programs.

CHAIRPERSON LUDERER: Any other comments or questions?

Dr. Quintana.

PANEL MEMBER QUINTANA: Can I keep making unrelated comments, is that okay?

(Laughter.)

PANEL MEMBER QUINTANA: I wanted to say that I think one of the most exciting and progressive aspects of the California Biomonitoring has been the results return and the amount of thought that's been put into that. And its really cutting edge for the whole world, and people look to us -- this Program, you know, for advice on that issue. And I would very much like to see what has been learned about best practices and some of the results. I understand that participant's understanding is being evaluated by people at UC Berkeley and others. And I'd love to hear more on that issue and where we stand on that.

CHAIRPERSON LUDERER: Yeah. And so it sounds like specifically the MIEEP and the BEST would have the -- already have evaluations of participant understanding.

And so those might be ones that would be great to hear back on.

MS. HOOVER: This is Sara Hoover, OEHHA. This is probably the first time I've said that all day.

Yeah, we have been planning for a while to schedule time for that. And the MIEEP would be a guest speaker, Dr. Rachel Morello-Frosch and then Duyen Kauffman and Laura Fenster have been planning the BEST evaluation. So we'd hear a report back on that.

So some of these topics are sort of like things we've been planning, and we're just showing you, you know, we've been tracking your requests and we'll definitely take those into account.

I just did want to add one other thing, circling back to something that Dr. Fiehn said, which I think is a really good point, which is I think what you're saying, and correct me if I'm wrong, is that you'd like to see -- instead of just bringing a class, and then bringing another class, and so on and so forth, to get a better picture of like what our overall strategy is, what we're currently measuring. If we were to pursue something, what else would that take away?

So sort of a priority picture, because that's some work we're actually doing, and Michael alluded to, about this priority setting process that we're working on.

So I want to just sort of highlight what you said, and say I agree. I think that's really important to give a clearer picture, particularly given the restricted resources we're now faced with.

CHAIRPERSON LUDERER: Dr. Fiehn.

PANEL MEMBER FIEHN: Yes, that's what I meant.

(Laughter.)

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: I'll just keep saying different things, if I can. I guess to quickly follow up on what you said about the representativeness of a California population, I think that expanding to Southern California is a very interesting idea, in terms of having a collaboration already happening with Kaiser. But I would also like to have a discussion of how representative that is. I know that the initial plan for completely randomized population-based sample, such as NHANES, is not able to be carried out because of financial limitations.

But I think we have to be very clear and carefully evaluate how representative any populations that we look at are, and have that evaluated kind of explicitly.

CHAIRPERSON LUDERER: Dr. Bradman.

PANEL MEMBER BRADMAN: I just wanted to say I know I'm particularly interested in the screening that's

going on with the pesticides imidacloprid, glyphosate, and some of the other compounds that are under consideration.

So I think we're coming to the point though where we'd look at the list of suggested topics, we're kind of saying they're all potentially important and interesting.

I know, on an attention basis, I like the format where we have some information and discussion and a guest speaker. So to the extent that we have guest speakers to spread them out. And in a way, I think it helps with the flow of the meetings and kind of different -- requires different intellectual demands, and therefore, I think makes it interesting and more effective.

CHAIRPERSON LUDERER: Okay. It wasn't on.

Dr. DiBartolomeis.

DR. DiBARTOLOMEIS: This will give you a chance to think of some more things. But I actually want to go back to something that, Dr. Bradman, you raised about 20 minutes ago, and I saw people nodding, maybe some agreement.

I'm seeking clarification. When you were talking about exposures in children, are you specifically saying that you'd like some more discussion in the future, presentations, or something along the lines of starting to biomonitor children or are you talking still about taking archived blood, for example, from cord blood or whatever,

and doing those kind of experiments. Because there is a big difference between getting samples that are collected through, you know, archive -- through genetic disease screening or whatever or even the MIEEP Program versus actually targeting children and doing that whole process of biomonitoring children. So I just wanted some clarification, so we can go back and talk about it.

PANEL MEMBER BRADMAN: I was really thinking about the former, actually considering studies or biomonitoring to go out and collect samples from young children. Pregnant women and young children are obviously kind of a priority in terms of vulnerability. We have the MIEEP study.

There's a few studies around the State that have collected samples from kids. But, in general, I think when we think about a representative population in California, we shouldn't leave out, you know, the youngest and most vulnerable. EPA NHANES had the lowest age group of 6 to 11. But I think if we were to move forward and do any kind of representative sampling, it would be great to include a full age spectrum.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: This is something that's not even on the sheet of that huge long list of things, but I've been trying to talk to everyone I meet about the

public, what would the public be interested in this kind of Program doing? I was asking them just to get a feeling for everyone I run into, moms or whatever. What are areas, are they plastics, like phthalates, are they pesticides, what areas do people I run into are they most interested in?

And I just wanted to bring up, not necessarily make it a topic for discussion, unless other people are interested, but what I hear over and over again from everyone I talk to -- and maybe this is a very California-specific exposure, but they want to know about diet? They want to if I'm a vegan, do I have lower levels of persistent pollutants in my body? You know, if I'm a vegetarian is it lower? Are there lower pesticides if I eat organic? And that's what I hear a lot is looking at diet specifically just.

So since I'm asking people what they want to hear, I told them I'd bring it back to this Panel and tell you guys that's what I'm hearing.

CHAIRPERSON LUDERER: Thank you for doing that.

Other ideas for 2015 from the Panel or do you think you have gotten enough feedback from us? Is there a specific thing you'd like us to address that we haven't yet?

MS. HOOVER: I mean, I think like what you were

all saying is the list we have is pretty good, and there's some additions. Just -- and given Dr. Fiehn's comment about having perspective on the overall look, but a couple years ago when we asked if there was any interest in potential priority chemicals, we were asked to do this excerpt of what designated chemicals are not yet priorities. So we included that. And I just -- we heard from the public that VOCs is on -- you know, has been commented on as something to move to priority.

So I would kind of like to get a sense from the Panel about of those that are designated, are there any others that you'd like us to potentially bring to you as potential priority, you know, in the face of limited resources and so forth, always having that context in the background? And do you -- you know, what's your -- what's the Panel's comment about VOCs. We heard a little bit about, you know, concerns about VOCs.

But in terms of scheduling time, you know, having an item on potential priority chemicals, are there particular things on this list that strike you as Panel members?

CHAIRPERSON LUDERER: I think -- I mean, maybe I could speak, I think several Panel members agreed that discussing VOCs as a potential priority class, given the interest and the ubiquity of the exposures, correct me I'm

wrong, if I'm misinterpreting what they said, but I think there was interest among the Panel members for doing that, and, you know, with the acknowledgement that some VOCs are already on the designated list. And obviously, that's not VOCs as a class. It's only those VOCs.

So that might be another point for discussion, I suppose, would be whether the Panel would recommend VOCs as a class as opposed to the way it is now, where it is compound by compound. And I don't know what other Panel members think about that, but it's sort of two different things.

Dr. Fiehn.

PANEL MEMBER FIEHN: Well, obviously, VOCs refer to a physical chemical property, which is very broad. You know, so we discussed today about the nitro-PAHs, and, you know, obviously, they're very volatile. And so, you know, then we discussed particulate matter with -- you know, to -- you know, so there is -- it's very difficult, I think, technically and even philosophically, I guess. You know, because they're -- you know, from ethylene to nitro-PAHs, there's a huge span, and it's demanding.

But discussing yes, but I'm not sure if -- right now, I would not be sure if it's wise to then say, you know, just general VOCs, you know, because they're too different.

CHAIRPERSON LUDERER: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: What I heard in the request from the public that we got was that it was mainly VOCs that are involved -- or to which people are exposed because of gas exploration. And so if we were wanting to be responsive to that request, if we felt like that was something that we wanted to consider, maybe that's a way to narrow that focus is -- that's what I heard in that request, is that it was mainly about exposures in communities where there's current gas exploration and drilling.

And then I had a separate comment, if I could, just in terms of highlighting chemicals on the list of designated chemicals that haven't been prioritized yet. I would sort of echo Dr. Bradman's interest in pesticides, and add my own about phthalate alternatives. Kind of adding to my earlier comment about wanting to include classes of compounds. And I think the tendency to look to not just what's in a class, but what's being used as the alternative is very important.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: I'd like to second that. I heard that several -- many times from the members of the audience as well that it's the substitutes and this complete -- constantly changing world that's important.

So maybe we could think of classing them by use, in a way making it quite broad to make sure we're catching all those substitutes, when we're considering these agents.

Because they are moving new chemicals in all the time, flame retardants, and phthalate substitutes, as you say, so I'd like to second that comment.

CHAIRPERSON LUDERER: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: This is a question, just because I haven't been involved in these discussions very much to date. What's the role of considering the function of a chemical, which is something that you just sort of mentioned, like plasticizer, as in -- as we seek to define classes of chemicals?

I mean, for some functional uses that would be so broad as to be not helpful. But I wonder if there are some functional uses where looking at how a chemical is used, rather than the compound itself, and the class of chemically related compounds would be useful.

CHAIRPERSON LUDERER: Yeah. I mean, I think the flame retardants are one example where we're kind of -- I mean, we're grouping them by structurally related flame retardants, but, yeah.

PANEL MEMBER SCHWARZMAN: But they're selected because they're being used as flame retardants. Yeah. I think -- we may think a little bit more about which other

functional uses like that would be relevant. And I think phthalates may be or plasticizers may be one example.

CHAIRPERSON LUDERER: Dr. Quintana.

PANEL MEMBER QUINTANA: I had a question for Sara, so it's good you're coming up, or Laurel. I think sometime ago, I sent you -- there was a paper that came out within the last six months on potential biomarkers for chemicals associated with breast cancer risk.

MS. HOOVER: Yeah.

PANEL MEMBER QUINTANA: And I believe I sent you that paper. And I was wondering if we have formally compared the list of chemicals in that paper against what we actually measure and discuss what isn't on there, I guess?

MS. HOOVER: So you actually raised that I think in July and raised it as an interesting point as part of our systematic review. So that is in -- you know, that's in our group of things to look at as part of our systematic review, yes. So we'll be doing that.

I did want to bring it back also to Laurel noted that things we have planned for 2015, which seems to resonate with people already, is PFASs as a class, and phthalates as a class. So it sounds like Panelists are on board with that.

We have limited, you know, ability to do much

more than that. And one of the reasons, just to really emphasize why we would raise those up, is because of a realistic ability from the lab to build on existing methods. So that is one kind of criterion, when we screen possible chemical selection.

So after say phthalates as a class, PFCs as a class, I heard like pesticides is an important thing to pull out potentially down the road for our next set of candidates. But anything else just sort of in your list of as we go down for say new designated chemicals, are there particular other things you'd want us to slot under those two that we've picked out as our 2015 priorities. This is for potential -- considering as a potential designated chemical. That was on Laurel's slide. It's also on your list.

CHAIRPERSON LUDERER: Any designated chemicals that are not current, so basically new designated chemicals?

Actually, one of the -- this is related, I think, to the discussion that we had about cosmetics at the last meeting. But I think it would be very interesting to hear about additional classes of musks, the fragrance -- we already talked about -- I mean, we had already designated I think some of the synthetic musks. And so this was to talk about the alicyclic and macrocyclic musks. I would

be interested in that. I think -- other comments from Panel members?

Well, we're about at the time that we had allotted for this topic. Is there more Public Comment or --

MS. HOOVER: No.

CHAIRPERSON LUDERER: Next item. All right. So our next agenda item is, as I mentioned earlier, is that we have a letter that the Scientific Guidance Panel discussed writing a letter of support for the Biomonitoring California Program, in particular supporting maintaining funding for the Program. And so we wanted to take this time now to pass around the final copy for Panel members to sign.

So we can start at one end here, and -- do you want to pass it down to the -- maybe to the end and we can just go down, or sign it as you go.

So the recommendation that the Panel should I -- is making -- do you have a pen? The Scientific Guidance Panel is recommending that State funding for Biomonitoring California be increased to provide an ongoing commitment of total funding equivalent to what the funding has been over the last five years from both the CDC sources, the CDC funding, as well as the State baseline funding, because we're really afraid that if the

funding decreases, as it has, that the impressive gains that are made by the Program during the last five years might not be sustainable, and we think that would be a real tragedy.

And then while we're signing, I can also maybe announce at this point that there are 10 minutes allotted for open public comment period, and ask whether there are any members of the public who wish to make a comment during the open comment period?

No.

And I can also announce while we're signing, that the transcript of this meeting is going to be posted on the California -- the Biomonitoring California website when available, as is done after every meeting. And also to remind everyone that our next, as was presented in one of the slides earlier, that the next SGP meeting is going to be on March 13th, 2015. And that will be in Oakland. The next two meetings will be in Oakland.

All right. I think we're almost done. And I would like to thank everyone for coming and staying till the end of the day. And I think we had a really interesting set of presentations today, great discussion, and we're all looking forward to the next meeting.

And I think we have our last person signing the letter, so I think we can adjourn the meeting with that.

And thank you, everyone, and have a safe trip home.

(Thereupon the California Environmental Contaminant Biomonitoring Program, Scientific Guidance Panel meeting adjourned at 4:38 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 17th day of November, 2014.

JAMES F. PETERS, CSR, RPR
Certified Shorthand Reporter
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