

MEETING  
STATE OF CALIFORNIA  
ENVIRONMENTAL PROTECTION AGENCY  
OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT  
ENVIRONMENTAL CONTAMINANT BIOMONITORING PROGRAM  
SCIENTIFIC GUIDANCE PANEL

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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, Commonwealth 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

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Office of Environmental Health Hazard  
Assessment (OEHHA)

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1 P R O C E E D I N G S

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

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

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

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

24 (Technical sound difficulties.)

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

1 headphones in, but apparently it still broadcasts from  
2 here.

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

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

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

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

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

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

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

7 I, Megan Schwarzman --

8 PANEL MEMBER SCHWARZMAN: I, Megan Schwarzman --

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

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

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

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

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

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

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

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

25 DIRECTOR ALEXEEFF: -- that I will bear truth



1 faith and allegiance --

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

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

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

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

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

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

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

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

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

23 DIRECTOR ALEXEEFF: Thank you.

24 (Applause.)

25 DIRECTOR ALEXEEFF: All right. At our last SGP

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

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

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

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

1 needed. There's five exits here.

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

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

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

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

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

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

18 Members of the public who are not here in person,  
19 but are participating via webcast, are invited to provide  
20 comments via email to [biomonitoring@oehha o-e-h-h-a](mailto:biomonitoring@oehha-o-e-h-h-a)  
21 [.ca.gov](mailto:biomonitoring@oehha-o-e-h-h-a). Biomonitoring California staff will provide the  
22 emailed comments to me, so that they can be read allowed  
23 during the meeting.

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

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

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

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

1 Dr. DiBartolomeis.

2 (Thereupon an overhead presentation was  
3 presented as follows.)

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

9 --o0o--

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

16 --o0o--

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

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

22 (Applause.)

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

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

3           Unfortunately, the Program overall has lost nine  
4 staff, mostly from the laboratories, and they will be --  
5 there will be more about that in the laboratory updates,  
6 due to the funding reductions that occurred at the end of  
7 2014 -- August 2014.

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

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

18                           --o0o--

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

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

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

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

25 The second grant went to the four corner states



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

8 --o0o--

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

21 --o0o--

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

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

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

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

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

23 And then the POPs will follow shortly.

24 --o0o--

25 DR. DiBARTOLOMEIS: With respect to the

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

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

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

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

24           DR. SHE: Over the weekend.

25           DR. DiBARTOLOMEIS: Over the weekend. Okay.

--o0o--

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.

--o0o--

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

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

5 --o0o--

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

17 --o0o--

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

25 --o0o--

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

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

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

19 (Applause.)

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

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

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

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

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

1           (Thereupon an overhead presentation was  
2           presented as follows.)

3           MS. ARNESEN: Thank you, Michael.

4           Good morning, members of the Panel and attendees  
5           here in the room, and those on webcast. I'm here to give  
6           a report on the evaluation of activities under the  
7           cooperative -- CDC cooperative agreement for the years  
8           2009 to 2014.

9                               --o0o--

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

16                               --o0o--

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



1 metals, OH-PAHs, PFCs and PBDEs.

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

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

11                       --o0o--

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

17                       --o0o--

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

20                       --o0o--

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

24                       --o0o--

25           MS. ARNESEN: These are selected findings for

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

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

13 --o0o--

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

19 --o0o--

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

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

4 --o0o--

5 MS. ARNESEN: Objective 2 recommendations. These  
6 are priority recommendations that came from the laboratory  
7 evaluation. First of all, to develop a Quality Assurance  
8 Program Plan for the overall Program, achieve  
9 Environmental Chemistry Laboratory accreditation under ISO  
10 17025, to better integrate biomonitoring activities into  
11 Environmental Health Laboratory's internal audit and  
12 management review process, and to improve documentation  
13 and decreased time necessary to finalize standard  
14 operating procedures.

15 --o0o--

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

21 --o0o--

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

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

14 In addition, interview and survey respondents  
15 spoke quite highly of the Program in relation to Objective  
16 3, stating that the Program had done, you know, remarkably  
17 well at being able to identify and access targeted  
18 populations.

19 --o0o--

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

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

4 --o0o--

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

11 --o0o--

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

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

25 --o0o--

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

6 --o0o--

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

12 --o0o--

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

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

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

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

14 --o0o--

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

23 --o0o--

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

--o0o--

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

--o0o--

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.

--o0o--

MS. ARNESEN: Lastly, these are some additional



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

8 --o0o--

9 Thank you.

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

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

21 Any questions?

22 Dr. McKone.

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

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

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

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

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

25 DR. DiBARTOLOMEIS: I'll just really quickly

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

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

13 PANEL MEMBER MCKONE: No, I actually haven't  
14 looked at it.

15 (Laughter.)

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

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

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

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

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

9 CHAIRPERSON LUDERER: Dr. Bradman.

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

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

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

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

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

12 So one way we're addressing that is with these  
13 archive samples with the Genetic Disease Screening  
14 Program. And if this is successful -- we call our first  
15 600, you know, like kind of pilot. If this is successful,  
16 that's a sustaining way of getting not quite a random  
17 representation of the public, but certainly to continue to  
18 add to that database.

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

23 PANEL MEMBER BRADMAN: Right. Okay.

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

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

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

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

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

7 CHAIRPERSON LUDERER: Dr. Quintana.

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

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

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

6 CHAIRPERSON LUDERER: Dr. Alexeeff.

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

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

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

21 So thanks.

22 CHAIRPERSON LUDERER: Dr. Schwarzman.

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



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

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

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

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

12 PANEL MEMBER SCHWARZMAN: Thanks.

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

17 MS. DUNN: We do not.

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

21 MS. DUNN: We do have a public comment.

22 CHAIRPERSON LUDERER: Oh, okay. Great.

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

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

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

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

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

1 well-documented linkages between VOCs and disease.

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

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

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

1 may cause irritation to the eyes, nose, throat.

2 Headaches, nausea, and nerve problems can also occur.

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

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

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

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

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

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

9           I'll give copies of these letters to Amy.

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

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

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

18          CHAIRPERSON LUDERER: Thank you very much.

19          MS. PATTON: Yes.

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

22          Okay. Thank you very much

23          MS. PATTON: Thank you.

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

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

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

9 Dr. She.

10 (Thereupon an overhead presentation was  
11 presented as follows.)

12 DR. SHE: Give me second.

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

18 --o0o--

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

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

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

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

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

17 --o0o--

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

23 --o0o--

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

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

5 --o0o--

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

11 --o0o--

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

16 --o0o--

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

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



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

4 --o0o--

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

15 --o0o--

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

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

3 --o0o--

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

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

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

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

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

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

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

18                           --o0o--

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

1 can be identified exactly too.

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

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

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

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

25 --o0o--

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

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

12 --o0o--

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

18 --o0o--

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

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

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

3 --o0o--

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

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

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

21 --o0o--

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

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

5 Thank you.

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

9 Dr. Fiehn.

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

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

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

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

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

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

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

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

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

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

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



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

5 PANEL MEMBER FIEHN: Okay. Thank you.

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

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

10 CHAIRPERSON LUDERER: Dr. Bradman.

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

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

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

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

13 CHAIRPERSON LUDERER: Dr. Schwarzman.

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

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

1 who the sample population might be in mind for that.

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

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

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

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

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

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

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

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

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

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

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

19           (Thereupon an overhead presentation was  
20 presented as follows.)

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

24           --o0o--

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

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

6 --o0o--

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

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

22 (Laughter.)

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

25 --o0o--

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

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

21 --o0o--

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

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

5 --o0o--

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

14 --o0o--

15 DR. PETREAS: Now our biggest study is the  
16 Teachers Study. And again, as of this month, we have  
17 received close to 2,500 samples. And we have aliquoted  
18 about 2,000 of them. This is a major endeavor to do the  
19 aliquoting, because we're sending samples for lipids  
20 analysis and thyroid hormone analysis separately, and then  
21 we move down these tracks of analysis for PFCs, for PBDEs,  
22 and the PCBs and OCPs in a different track. And so we're  
23 able to release data to the principal investigator for  
24 1,300 PFCs and almost 1,300 PBDEs. We're behind on the  
25 PCB, OCP because of instrument limitation. We have to

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

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

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

22 --o0o--

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



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

10           Oops. Sorry.

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

21                           --o0o--

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

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

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

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

14 --o0o--

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

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

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

4 --o0o--

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

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

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

1 additional chemicals that people are starting to look at.

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

5 --o0o--

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

16 --o0o--

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

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

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

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

11 --o0o--

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

18 --o0o--

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

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

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

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

21                       --o0o--

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

1 our bodies, and they complement the biomonitoring  
2 measurements.

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

10 --o0o--

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

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

--o0o--

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



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

7           So great work.

8           DR. PETREAS: Thank you.

9           CHAIRPERSON LUDERER: Dr. Quintana.

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

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

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

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

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

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

22 Do we have any public comments?

23 MS. DUNN: We do not.

24 CHAIRPERSON LUDERER: We do not.

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

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

3 Dr. Bradman.

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

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

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

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

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

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

12 Dr. She.

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

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

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

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

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

6 CHAIRPERSON LUDERER: Dr. Quintana.

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

16 CHAIRPERSON LUDERER: Dr. Fiehn.

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

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

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

19           CHAIRPERSON LUDERER: Dr. Quintana.

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

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

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

10 CHAIRPERSON LUDERER: Dr. Fiehn.

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

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

25 So I do not see any reason not to look for

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

8 CHAIRPERSON LUDERER: Dr. Quintana.

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

12 (Laughter.)

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

25 CHAIRPERSON LUDERER: Dr. Bradman.



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

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

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

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

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

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

13 CHAIRPERSON LUDERER: Great. Wonderful.

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

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

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

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

11 Thank you again.

12 MS. DUNN: Could you identify yourself.

13 MS. BUERMAYER: Nancy Buermeyer with the Breast  
14 Cancer Fund.

15 CHAIRPERSON LUDERER: I was just about to say  
16 that.

17 (Laughter.)

18 CHAIRPERSON LUDERER: Thank you very much.

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

21 Dr. McKone.

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

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

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

15 CHAIRPERSON LUDERER: Dr. Schwarzman.

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

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

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

6 CHAIRPERSON LUDERER: Dr. Fiehn.

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

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

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

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

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

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

1 and in the same way it's done for clinical trials.

2 There's a lot of history how to secure patient  
3 confidentiality and subject confidentiality.

4 CHAIRPERSON LUDERER: Dr. Quintana.

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

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

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

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

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

11           So, Fran.

12           STAFF COUNSEL KAMMERER: Thank you, Dr. Luderer.

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

19           Thank you.

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

22           (Off record: 12:00 PM)

23           (Thereupon a lunch break was taken.)  
24  
25



## 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

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

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

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

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

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

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

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

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

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

18 So please welcome Dr. Marty.

19 (Thereupon an overhead presentation was  
20 presented as follows.)

21 DR. MARTY: Thank you, Dr. Ulrike.

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

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

1 couple of, really, concepts.

2 --o0o--

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

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

14 --o0o--

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

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

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

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

6 --o0o--

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

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

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

22 --o0o--

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

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

10 --o0o--

11 DR. MARTY: This graph depicts the results of  
12 OEHHA's meta-analysis. So in 1998, OEHHA, as part of the  
13 team that works on identifying toxic air contaminants,  
14 conducted a health effects assessment. As part of that  
15 assessment, we reviewed the literature to date then. This  
16 is a figure looking at our meta-analysis, where we  
17 evaluated studies that had looked at the relationship  
18 between diesel engine exhaust exposure in the workplace  
19 and lung cancer. And you can see from the figure that the  
20 effect estimates jump -- you know, jump up and down right  
21 above 1. Some of them statistically significant in the  
22 individual studies. Using our meta-analysis -- analytical  
23 techniques, we can see that the relative risk is around  
24 1.4 and it's highly statistically significant.

25 --o0o--

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

7 Interestingly, there Laden published a paper in  
8 '06 and provided an odds ratio for COPD of about 1.6, also  
9 statistically significant. And this is for a group of  
10 railroad workers who worked in the industry after engines  
11 were dieselized. So they used to be electric and then  
12 they became diesel in the fifties.

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

20 --o0o--

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

1 of railroad workers. So we based the estimates on a  
2 couple of studies by Eric Garshick on railroad workers.  
3 And essentially in a nutshell, the 95 percent upper  
4 confidence limit on the slope of the dose response curve  
5 ranged from about 1.3 times 10 to the minus 4 to 2.4 times  
6 10 to the minus 3 per microgram diesel engine particulate  
7 per cubic meter.

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

15 --o0o--

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

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



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

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

13 --o0o--

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

23 --o0o--

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

1 Control Measures. And these are regulations promulgated  
2 to reduce emissions from a variety of sources. From about  
3 '05 to 2012, as this histogram depicts, there's been about  
4 a 45 percent reduction in PM2.5 emissions from diesel  
5 sources in California, as a result of promulgating these  
6 regulations, and industry coming to the plate and making  
7 changes also.

8 --o0o--

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

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

24 --o0o--

25 DR. MARTY: This is blowup of what that looks

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

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

10 --o0o--

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

16 --o0o--

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

21 --o0o--

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

1 organic carbons -- compounds, including formaldehyde  
2 1,3-butadiene, and so on.

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

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

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

21                               --o0o--

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

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

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

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

13 --o0o--

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

21 --o0o--

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

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

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

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

17 --o0o--

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

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

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

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

17 --o0o--

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

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

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

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

22 --o0o--

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



1 of them that's been most explored, and you'll hear about  
2 that in a second from Dr. Simpson, has been 1-nitropyrene,  
3 and in particular measuring the urinary metabolites of  
4 1-nitropyrene.

5 This particular nitro-PAH is found, especially in  
6 diesel engine exhaust, and less so in other sources,  
7 including tobacco smoke. So it has a better specificity.  
8 And as I mentioned, Dr. Simpson will discuss his methods  
9 and results using a number of hydroxylated metabolites of  
10 1-nitropyrene as potential biomarkers for diesel exhaust  
11 exposure.

12 --o0o--

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

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

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

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

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

14 (Laughter.)

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

17 I'm done.

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

24 Dr. Fiehn.

25 PANEL MEMBER FIEHN: Thank you. It was a very

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

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

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

24 CHAIRPERSON LUDERER: Dr. McKone.

25 PANEL MEMBER MCKONE: Yeah, I also want to

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

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

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

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

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

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

15 PANEL MEMBER MCKONE: Am I allowed to do another  
16 one?

17 CHAIRPERSON LUDERER: Dr. McKone.

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

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

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

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

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

23 CHAIRPERSON LUDERER: Dr. Schwarzman.

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

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

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

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

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

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

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

5 CHAIRPERSON LUDERER: Dr. Quintana.

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

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

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



1 you know, is a very powerful tool.

2 DR. MARTY: Good comment.

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

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

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

25 Dr. Simpson's research involves applying state of

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

8 Welcome, Dr. Simpson.

9 (Thereupon an overhead presentation was  
10 presented as follows.)

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

16 --o0o--

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

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

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

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

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

15 --o0o--

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

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

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

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

21 --o0o--

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

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

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

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

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

17 It should also be noticed that in contrast to the  
18 other nitropyrene isomers, 1-nitropyrene, for most part,  
19 is not formed to a significant extent by a photochemical  
20 reactions. So that isomer 2-nitropyrene that very much is  
21 formed from secondary photochemical chemical reactions and  
22 is not specific to diesel exhaust. There have been a few  
23 examples where it's been shown that it is possible to form  
24 1-nitropyrene from secondary reactions, but that makes  
25 only a small contribution to the total overall ambient

1 1-nitropyrene concentrations.

2 --o0o--

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

10 In general, 1-nitropyrene emissions and particle  
11 emissions also are dramatically lower in new generation  
12 diesel engines compared to traditional diesel engines. So  
13 that is a point that certainly we have to acknowledge.  
14 Nevertheless, in the data that I'll show you,  
15 1-nitropyrene is certainly present and currently used in  
16 diesel engines.

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

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

5 --o0o--

6 DR. SIMPSON: So here's some environmental data  
7 collected in Japan, where they measured a series of  
8 different PAHs and nitro-PAHs, and used a combination of  
9 source testing and source apportionment in order to  
10 calculate the contribution or the fraction of the  
11 1-nitropyrene in these three Japanese cities that was  
12 derived from diesel exhaust. And you can see that in this  
13 particular example, greater than 99 percent of the ambient  
14 nitropyrene was found to be derived from diesel exhaust.

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

21 --o0o--

22 DR. SIMPSON: So the example that I'm showing you  
23 now is much more recent from data that was collected in  
24 2008-2009 in the Duwamish Valley in Seattle. This is --  
25 this part of Seattle is just downtown from the major urban

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

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

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

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

25 And then the final point, we conducted a positive



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

10 --o0o--

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

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

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

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

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

11 --o0o--

12 DR. SIMPSON: So the take-home message from those  
13 three examples is that despite the questions about  
14 variability and chemistry of diesel exhaust and changing  
15 emissions of diesel exhaust, and these recent measurements  
16 to try and get at the association between 1-nitropyrene  
17 and trucks or -- and sources of diesel exhaust in ambient  
18 samples in an American city, we see pretty strong  
19 associations between diesel features and the  
20 1-nitropyrene.

21 --o0o--

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

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

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

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

22 --o0o--

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

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

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

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

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

1 experienced by residents of San Ysidro and South San  
2 Diego.

3           So the gestalt of those data is that the trend in  
4 nitropyrene concentration parallels what you would expect  
5 based on either proximity to sources of diesel emissions,  
6 so proximity to traffic. And furthermore, that the trend  
7 parallels what we would expect based on the varying range  
8 of emissions controls. So in California we have pretty  
9 good emissions controls. The diesel exhaust -- or the  
10 1-nitropyrene concentrations are much lower compared to  
11 Mexico or compared to Shenyang.

12                           --o0o--

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

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

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

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

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

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

22 --o0o--

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

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

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

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

20                               --o0o--

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

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

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

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

12 --o0o--

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

23 --o0o--

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



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

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

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

14                           --o0o--

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

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

1 per cubic meter of nitropyrene.

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

16                   --o0o--

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

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

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

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

16                               --o0o--

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

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

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

11 --o0o--

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

21 Thank you.

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

25 We have a few minutes now for some Panel

1 questions for Dr. Simpson?

2 Dr. Quintana.

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

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

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

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

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

4 CHAIRPERSON LUDERER: Dr. Fiehn.

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

11 DR. SIMPSON: Yeah.

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

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

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

1 shows it's weak.

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

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

20 CHAIRPERSON LUDERER: Dr. Bradman.

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

25 But one thing to consider in terms of going

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

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

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

25           So there might be some opportunities to do some



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

3 (Laughter.)

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

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

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

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

21 So we have one public comment. This is from Joe  
22 Suchecky from the Engine Manufacturers Association.

23 (Thereupon an overhead presentation was  
24 presented as follows.)

25 MR. SUCHECKY: Yes. Thank you. I'm Joe Suchecky

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

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

18 The other issue is on the biomarkers. Both 2007,  
19 2010 engine technology, which was a major regulatory  
20 development in new technology, they essentially have  
21 eliminated PAHs and nitro-PAHs compounds that may be  
22 considered. As an example, in the 1-nitropyrene that  
23 you're talking about, emissions information indicate that  
24 2010 engines there's none detected being emitted from  
25 those engines.

--o0o--

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.

--o0o--

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.

--o0o--

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.

--o0o--

1 MR. SUCHECKI: What the emissions profile has  
2 done is it's increased or decreased everything across the  
3 board. And here is just a chart that shows you for the  
4 2010 engines, which is our model that's out there now,  
5 even greater reductions from 2007. We've had actually 99  
6 percent reductions in -- 92-99 percent reductions in most  
7 of the compounds relative to the 2007 engines. And as you  
8 can see, again compared to the pre-technology, the 2004  
9 engines, nearly a hundred percent reduction, especially in  
10 like your PAHs and N-PAHs. Elemental carbon has been  
11 reduced, so there's essentially no carbon left in the  
12 emissions.

13 --o0o--

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

1 But for those emissions from 2010 engines, before  
2 2007, as you see, there was a lot of 1-nitropyrene, 630  
3 nanograms per horsepower. 2007, we had dropped to 20, and  
4 now for the 2010 engines, it's, you know, below the  
5 detection levels in the test.

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

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

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

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

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

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

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

14 Dr. Quintana and then Dr. Bradman.

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

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

1 (Laughter.)

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

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

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

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

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

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

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



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

5 And so when you have that small regeneration  
6 event, there is an increase in the number of fine  
7 particles released, but it's essentially non-carbonaceous,  
8 so it's probably mostly sulfate particles. And then also  
9 it's still a lot lower by orders of magnitude than what  
10 the -- what an uncontrolled diesel engine or would even a  
11 2007 engine would be.

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

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

3 CHAIRPERSON LUDERER: Dr. Bradman.

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

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

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

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

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

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

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

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

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

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

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

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

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

7 Dr. Quintana. Oh, two.

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

12 MR. SUCHECKI: Right.

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

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

22 MR. SUCHECKI: Well, we have --

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

1 process.

2 MR. SUCHECKI: Right. Right.

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

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

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

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

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

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

10 PANEL MEMBER MCKONE: Thank you.

11 CHAIRPERSON LUDERER: Dr. Quintana one quick  
12 question.

13 MR. SUCHECKI: Thank you very much.

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

17 (Thereupon an overhead presentation was  
18 presented as follows.)

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

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

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

9 --o0o--

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

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

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



1 engines depending on the study.

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

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

10 CHAIRPERSON LUDERER: Dr. Alexeeff.

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

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

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

1 be affecting that?

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

14 CHAIRPERSON LUDERER: Dr. Quintana.

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

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

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

6 John Collins is also from ARB.

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

10 MS. HOOVER: Can you speak into the mic?

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

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

25 PANEL MEMBER QUINTANA: I just asked because

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

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

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

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

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

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

12 (Laughter.)

13 PANEL MEMBER QUINTANA: Thank you for stepping  
14 up.

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

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

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

5           With the 2010 generator, there was about a  
6 10-fold difference in nitropyrene per gram of particles  
7 for lower versus high load. So the low load had much more  
8 nitropyrene than the high load. So that was to try and  
9 directly answer your question about changes in the  
10 chemistry.

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

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

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

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

5 CHAIRPERSON LUDERER: Thank you very much.

6 Do we have any other Panel questions of the  
7 speakers?

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

18 Dr. McKone.

19 PANEL MEMBER MCKONE: I'm a theorist, so bear  
20 with me.

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

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

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

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

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



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

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

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

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

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

8 CHAIRPERSON LUDERER: Dr. Quintana.

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

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

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

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

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

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

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

24 CHAIRPERSON LUDERER: Dr. Bradman.

25 PANEL MEMBER BRADMAN: Just for discussion, I

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

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

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

22 (Laughter.)

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

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

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

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

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

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

9 Dr. McKone and Dr. Alexeeff.

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

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

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

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

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

11 CHAIRPERSON LUDERER: Dr. Schwarzman.

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

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

1 collect the wrong sample.

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

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

14 CHAIRPERSON LUDERER: Dr. Fiehn.

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

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



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

15 CHAIRPERSON LUDERER: Dr. Quintana.

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

25 So I think that given that filter, a panel is

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

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

16 Dr. Alexeeff, I forget you had a question.

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

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

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

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

11 CHAIRPERSON LUDERER: Dr. McKone.

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

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

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

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

11 CHAIRPERSON LUDERER: Dr. Marty.

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

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

1 nitro-PAHs as the exposure marker.

2 Just throwing that out there.

3 CHAIRPERSON LUDERER: Thank you.

4 Dr. Simpson.

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

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

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

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

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

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

23 CHAIRPERSON LUDERER: Thank you.

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

25 DR. SHE: This question might be more for

1 Professor Simpson. I just wanted to check the reference,  
2 it's one part of the 1-nitropyrenes and also you measure  
3 the metabolite 1-nitropyrenes and then that's a question  
4 should we measure both of them, metabolite of  
5 1-nitropyrene, 1-nitropyrene plus what Dr. Ulrike Luderer  
6 mentioned combined with hydroxy-PAH? Is that a reasonable  
7 approach? Also, look at the structure of 1-nitropyrene is  
8 a bigger ring, four rings. So I assume that it'll go to  
9 the feces beyond the urine excretion. So what's the  
10 possibility, if not combined with the blood, is the feces  
11 combined with urine matrix.

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

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

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

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

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

13 None via email.

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

16 CHAIRPERSON LUDERER: Sure. Please, go ahead.

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

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



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

7 CHAIRPERSON LUDERER: Thank you.

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

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

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

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

1 have time to talk about, but you could start with  
2 something like that, and then you could look at a more  
3 sophisticated design where you try to use other measures.  
4 You know, using nonspecific markers of genotoxicity in the  
5 blood, using measurements -- you know, air measurements of  
6 some sort, so there's different approaches if we actually  
7 took it to a study. The idea of comparing like 580 to  
8 880, I think there's a lot of options for, you know,  
9 teasing this out in some way, but we have to start  
10 somewhere.

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

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

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

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

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

16 Dr. Bradman.

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

19 (Laughter.)

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

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

3 CHAIRPERSON LUDERER: Dr. Fiehn.

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

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

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

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

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

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

8 (Off record: 3:29 PM)

9 (Thereupon a recess was taken.)

10 (On record: 3:44 PM)

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

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

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

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

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

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

6 So, Dr. Plummer.

7 (Thereupon an overhead presentation was  
8 Presented as follows.)

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

18 So it's just a quick little presentation here.

19 --o0o--

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

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

5                               --o0o--

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

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

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

9                       --o0o--

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

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

22                       --o0o--

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



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

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

21 --o0o--

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

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

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

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

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

23                           --o0o--

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

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

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

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

24 --o0o--

25 DR. PLUMMER: Under potential priority chemicals,

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

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

16 --o0o--

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

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

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

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

20                       --o0o--

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

1 welcome additional suggestions that you might have.

2 Thank you.

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

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

8 CHAIRPERSON LUDERER: Yes.

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

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

17 MS. DUNN: (Shakes head.)

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

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

22 CHAIRPERSON LUDERER: There is one more?

23 MS. DUNN: Yeah.

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

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

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

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

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

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

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

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

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

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

20 I have to thank Ms. Breech for that comment. And  
21 then we have another?

22 MS. DUNN: Two more.

23 CHAIRPERSON LUDERER: Two more.

24 Okay. So we have a comment from Veena Singla,  
25 Natural Resources Defense Council.



1 DR. SINGLA: Thank you. Veena Singla with the  
2 Natural Resources Defense Council. I wanted to express my  
3 support for the listing of phthalates and parent  
4 polyfluorinated substances, both as classes for the  
5 designated chemicals list.

6 The market for these chemicals is constantly  
7 changing, and many different phthalates and fluorinated  
8 chemicals are widely used in products. So I think it's  
9 important to have the flexibility to monitor for these as  
10 the use is shifting to new and different chemicals.

11 On the topic of new priority chemicals, I wanted  
12 to recommend carbamate insecticides and pyrethroid  
13 pesticides. Carbamates did shows significant use near  
14 California public schools in the recent report from the  
15 California Environmental Health Tracking Program. And  
16 pyrethroid pesticides are common replacements for  
17 organophosphate pesticides, both in agriculture and in  
18 indoors use. Data from NHANES indicates widespread  
19 exposure, and that children have higher exposure as  
20 compared to adults.

21 A recent study from UC Davis found that for  
22 pregnant women in California, residential proximity to  
23 agriculture pyrethroid pesticide applications increased  
24 risks for autism and developmental delays in their  
25 children.

1           On the possible agenda topics for 2015, I'd like  
2 to suggest for consideration discussion of pesticide  
3 biomonitoring to follow-up on the California Environmental  
4 Health Tracking Program report of pesticide use near  
5 public schools. And the information in that report could  
6 be used to inform biomonitoring studies, such as  
7 particular pesticides to monitor for and geographic  
8 locations of at-risk populations.

9           Thank you.

10           CHAIRPERSON LUDERER: And thank you very much for  
11 that input.

12           Our next public commenter is Nancy Buermeyer from  
13 the Breast Cancer Fund.

14           MS. BUERMEYER: Thank you very much. Nancy  
15 Buermeyer with the Breast Cancer Fund.

16           I just want to start by saying just generally  
17 congratulations to the staff and the Program and the Panel  
18 for all the incredible work. This is a really, really  
19 interesting program today. And as always, the amount of  
20 work done is very impressive.

21           I also wanted to comment on the chemical  
22 categories of both designated and priority. I want to  
23 strongly support adding phthalates as a class of chemicals  
24 to look at. You know, we've done a lot of work on  
25 phthalates as an organization as the Breast Cancer Fund

1 looking at the them in toys.

2           And there was a recent report that came out from  
3 the Consumer Product Safety Commission Chronic Hazard  
4 Advisory Panel that looked at a number of phthalates, many  
5 of which are on your list, but not all of which are on  
6 your list. And as concern for the different phthalates  
7 grows, and the use pattern changes, it would be really  
8 great for the Program to have the flexibility to be nimble  
9 about moving from a particular phthalate to a different  
10 phthalate. So we think that would be a really great move  
11 to make that a family chemical group, as opposed to just  
12 the individual chemicals.

13           In terms of chemicals we'd like to see moved from  
14 the designated list to the priority list, they would  
15 include the acrylamide set, and then to throw our hat into  
16 the ring on the VOCs. It's something we strongly support  
17 in addition to the comment you just read, and to  
18 Commonweal and Sharyle -- and the comment that Sharyle  
19 made.

20           And we'd also like to have you look at adding to  
21 the designated list, aromatic amines(a-meens) --  
22 amines(aw-meens). And then you talked a little bit about  
23 the functional group of UV filters. We would support  
24 adding those to the designated list of environmental  
25 phenols as well.

1           And also, we'd like to have you take a look at or  
2 think about nitrosamines. We actually look at chemicals  
3 from two different perspectives, one from breast cancer,  
4 as the Breast Cancer Fund, obviously, but we also -- we  
5 also run the Campaign for Safe Cosmetics, so we look at a  
6 lot of chemicals that are of concern in cosmetics. And  
7 some of these chemicals, like nitrosamines, are things  
8 that we want to do some more work at looking at. And  
9 having this kind of a biomonitoring ability would be  
10 really, really helpful.

11           So thanks, again, for all your great work and for  
12 allowing me to comment. Thanks.

13           CHAIRPERSON LUDERER: Thank you for the comments.

14           So we now have time for Panel discussion. I  
15 think we've already heard from several of the public  
16 commenters the -- there seems to be a lot of interest in  
17 including phthalates as a class in the -- among members of  
18 the public on the designated chemicals list as well as  
19 there was several comments supporting VOCs. And I -- that  
20 might be a point where we could start for discussion, but  
21 we could also start with any of the other topics as well  
22 too.

23           Dr. Quintana.

24           PANEL MEMBER QUINTANA: I want to say I agree  
25 with the public comments, and just wanted to add in

1 something Dr. Bradman said earlier, which was that  
2 children were definitely of interest to the Panel, and the  
3 public for a lot of these exposures, especially those that  
4 might come through house dust for example, or kind of some  
5 really age-specific exposures. And so along with your  
6 comment about phthalates in toys, I know that this genetic  
7 screening program and the maternal serum has an  
8 opportunity to get at some pregnant women exposures.

9 But we're still kind of, I think, missing that  
10 young children as a target for our Program, which kind of  
11 ties into some of these exposures. And if there's any  
12 comment on that, I'd like to hear it.

13 CHAIRPERSON LUDERER: Dr. Bradman.

14 PANEL MEMBER BRADMAN: Okay. Well, I just --  
15 just echoing what you echoed in terms of what I said,  
16 yeah. I mean, I think in general that it's important that  
17 we do start doing work looking at those populations. I  
18 remember talking about this with Michael at the very  
19 beginning of the Program, a number of years ago. And, you  
20 know, there are -- there is some work obviously going on  
21 with that with the MIEEP study.

22 But I think opportunities to look at exposures  
23 that affect young children should be a priority. And, you  
24 know, many of the studies that are -- that have gone on,  
25 for example, there were some measurements of phthalates in

1 our CHAMACOS samples, and -- but I would just echo, yes, I  
2 mean, you're echoing my comment earlier, that you know we  
3 should make that population a priority, especially for  
4 some of these things like indoor exposures. We heard  
5 about VOCs, phthalates and things like occur in dust.  
6 Flame retardants are very prevalent in dust, and probably  
7 that's the main exposure pathway of non-dietary ingestion.

8 So I know I would like to make that a priority.

9 CHAIRPERSON LUDERER: And I think we heard this  
10 morning too that dust is also a source of exposure to the  
11 per- and polyfluorinated compounds. And that was another  
12 item that was on the list that I think would also be  
13 important from that regard as well in consumer products  
14 exposures.

15 Any other?

16 PANEL MEMBER BRADMAN: I have a kind of a  
17 procedure question. In terms of the agenda today, are we  
18 supposed to be making decisions today about priority  
19 versus designated chemicals or these are suggestions that  
20 we should -- that will be considered in a future meetings.

21 CHAIRPERSON LUDERER: Things to consider.

22 PANEL MEMBER BRADMAN: Okay.

23 CHAIRPERSON LUDERER: Dr. Schwarzman.

24 PANEL MEMBER SCHWARZMAN: Thanks. I just wanted  
25 to weigh in in support, in general, of this consideration

1 of moving towards some chemical classes where they're  
2 relevant, because of, as the public commenters have  
3 mentioned, the issue of substitution, I think, is true in  
4 several of these categories. And we're able to cover so  
5 much more if we can just have the category on the  
6 designated list, and even some of these categories it  
7 looks like need to move to the priority list. I think  
8 that's true for phthalates. Although, I'm a little bit  
9 shaky on the history still.

10 But, in general, I think that's -- given what we  
11 know about how quickly the industry changes from one  
12 chemical to another, based on, you know, regulatory  
13 signals, but also just technical availability, I think  
14 moving toward having classes would be really useful.

15 CHAIRPERSON LUDERER: Thank you.

16 Any other comments from Panel members?

17 One question. One of your possible topics was  
18 for moving towards a representative statewide sample. And  
19 you were talking about the -- using the BEST population,  
20 as well as the Genetic Disease Screening Program. And one  
21 thing when we -- when the Pilot BEST was first being  
22 developed, one question that I had raised at that time -  
23 and I was wondering this might be a time to consider that  
24 again - would be to do maybe an Expanded Expanded BEST, if  
25 it's possible, to collaborate somehow with Southern

1 California Kaiser, so that it would be more of a statewide  
2 type of program. I don't know whether that's possible,  
3 but that might be something to consider.

4 Dr. Schwarzman.

5 PANEL MEMBER SCHWARZMAN: I have a question.  
6 Every time VOCs come up, which they have several times  
7 today, partly because of the public comment, we  
8 acknowledge the difficulty -- you know, some of the  
9 technical difficulties of biomonitoring for VOCs. And I  
10 just wanted to know if maybe we could hear a little bit  
11 more - if now isn't the time, that's okay - but when we  
12 take up this topic of how big a challenge that poses to  
13 the laboratory staff, what it would entail in terms of  
14 development of new methods versus just sort of redirecting  
15 the workflow, so that we have a better sense of the  
16 challenges that we would be asking the Program to  
17 undertake, if we were to suggest moving forward with VOCs?

18 PANEL MEMBER FIEHN: Yeah.

19 CHAIRPERSON LUDERER: Dr. Fiehn.

20 PANEL MEMBER FIEHN: Sorry. Yeah, that is also  
21 the same direction that I would like to see. So instead  
22 of just discussing about priority itself by chemical  
23 class, but also, you know, what it entails, because  
24 usually we go one class at a time. We discuss, say, the  
25 musks, or we discuss antimicrobial, you know,



1 disinfectants or so.

2           And we then say, yes, these are important  
3 compounds. There's clear toxicity. There's clear  
4 exposures. So, yes, they should be designated. But now  
5 that we, you know, want to put things onto priority lists,  
6 we need to put it all into perspectives, right, doability,  
7 sample availability, costs maybe, technical availability,  
8 and maybe also exposures that we know, and toxicities that  
9 we know. So it's a really difficult task, I think. And  
10 so we need time for that. That's what I wanted to say in  
11 terms of -- you know, in order to do it right, you need to  
12 have some time.

13           CHAIRPERSON LUDERER: Well, and I think that's  
14 one of the things that the Program is asking us. Of those  
15 designated chemicals that are not yet priority chemicals,  
16 which ones would we like to set aside time during the  
17 subsequent meetings that we're going to have next year to  
18 really get into, you know, the nitty-gritty, you know, the  
19 feasibility of biomonitoring, et cetera, for those either  
20 individual chemicals or groups of chemicals.

21           And we haven't really said much about that yet.  
22 Do Panel members have particular groups of chemicals or  
23 chemicals on the designated list that they'd like to make  
24 a case for bringing forward next year?

25           Dr. Quintana.

1 PANEL MEMBER QUINTANA: Well, are you talking  
2 about the designated list?

3 CHAIRPERSON LUDERER: Move to the priority list.

4 PANEL MEMBER QUINTANA: Well -- okay. I'll  
5 shelve my comment. It was about cotinine and other  
6 tobacco biomarkers, which is not suitable at this -- okay.

7 Well, one of the items on here was discussing if  
8 we should measure biomarkers of tobacco smoke exposure,  
9 secondhand smoke exposure, as well as primary smoking.  
10 And I would like to have a more expanded discussion of  
11 that, because that exposure to secondhand smoke has many  
12 of the compounds that we are measuring in people's blood  
13 and urine. And I think it would help greatly with  
14 interpreting our results with communicating our results to  
15 participants, in terms of identifying sources, and also  
16 telling them how this exposure might relate to secondhand  
17 smoke, for example, in terms of magnitude. And I think  
18 it's something I'd like to have a further discussion about  
19 on our Panel.

20 And that cotinine is a metabolite of nicotine, I  
21 should say. And it's on the priority list, is that  
22 correct? Yeah. And also NNAL is a metabolite of tobacco  
23 specific nitrosamine and that is also on the list and is  
24 currently measured by NHANES.

25 CHAIRPERSON LUDERER: Dr. Kavanaugh-Lynch.

1           PANEL MEMBER KAVANAUGH-LYNCH: I wanted to follow  
2 on that comment and see if there are possibilities of --  
3 in looking at measuring cotinine and other tobacco  
4 exposure is -- or nicotine exposure is to think creatively  
5 about whether there are ways to distinguish cigarette  
6 exposure from e-cigarette exposure and whether we need to  
7 add things to be able to do that? Because I think if  
8 we're going to do one, we should do both.

9           CHAIRPERSON LUDERER: Dr. Quintana.

10          PANEL MEMBER QUINTANA: Yeah. So I agree the  
11 e-cigarette is a very big exposure that's suddenly coming  
12 to our population in California. But cotinine again is a  
13 metabolite of nicotine, which is present in e-cigarettes.  
14 The tobacco-specific nitrosamines are less present in that  
15 liquid and so would be more specific to tobacco smoke.  
16 And one of them is currently measured. It may not be the  
17 only biomarker or the best biomarker, but it is currently  
18 on the list.

19          But I guess my comment was more to ask for time  
20 to discuss this further at future meetings, I mean, if  
21 it's something that we should pursue.

22          PANEL MEMBER KAVANAUGH-LYNCH: I agree. You  
23 know, I was just trying to add -- something to add to that  
24 topic when we discuss it.

25          CHAIRPERSON LUDERER: Dr. Kavanaugh-Lynch.

1 PANEL MEMBER KAVANAUGH-LYNCH: On an unrelated, I  
2 would also be very interested in the possibility we  
3 were -- of discussing collaborations with Safer Cosmetics  
4 Program and other State programs.

5 CHAIRPERSON LUDERER: Any other comments or  
6 questions?

7 Dr. Quintana.

8 PANEL MEMBER QUINTANA: Can I keep making  
9 unrelated comments, is that okay?

10 (Laughter.)

11 PANEL MEMBER QUINTANA: I wanted to say that I  
12 think one of the most exciting and progressive aspects of  
13 the California Biomonitoring has been the results return  
14 and the amount of thought that's been put into that. And  
15 its really cutting edge for the whole world, and people  
16 look to us -- this Program, you know, for advice on that  
17 issue. And I would very much like to see what has been  
18 learned about best practices and some of the results. I  
19 understand that participant's understanding is being  
20 evaluated by people at UC Berkeley and others. And I'd  
21 love to hear more on that issue and where we stand on  
22 that.

23 CHAIRPERSON LUDERER: Yeah. And so it sounds  
24 like specifically the MIEEP and the BEST would have the --  
25 already have evaluations of participant understanding.

1 And so those might be ones that would be great to hear  
2 back on.

3 MS. HOOVER: This is Sara Hoover, OEHHA. This is  
4 probably the first time I've said that all day.

5 Yeah, we have been planning for a while to  
6 schedule time for that. And the MIEEP would be a guest  
7 speaker, Dr. Rachel Morello-Frosch and then Duyen Kauffman  
8 and Laura Fenster have been planning the BEST evaluation.  
9 So we'd hear a report back on that.

10 So some of these topics are sort of like things  
11 we've been planning, and we're just showing you, you know,  
12 we've been tracking your requests and we'll definitely  
13 take those into account.

14 I just did want to add one other thing, circling  
15 back to something that Dr. Fiehn said, which I think is a  
16 really good point, which is I think what you're saying,  
17 and correct me if I'm wrong, is that you'd like to see --  
18 instead of just bringing a class, and then bringing  
19 another class, and so on and so forth, to get a better  
20 picture of like what our overall strategy is, what we're  
21 currently measuring. If we were to pursue something, what  
22 else would that take away?

23 So sort of a priority picture, because that's  
24 some work we're actually doing, and Michael alluded to,  
25 about this priority setting process that we're working on.

1 So I want to just sort of highlight what you said, and say  
2 I agree. I think that's really important to give a  
3 clearer picture, particularly given the restricted  
4 resources we're now faced with.

5 CHAIRPERSON LUDERER: Dr. Fiehn.

6 PANEL MEMBER FIEHN: Yes, that's what I meant.

7 (Laughter.)

8 CHAIRPERSON LUDERER: Dr. Quintana.

9 PANEL MEMBER QUINTANA: I'll just keep saying  
10 different things, if I can. I guess to quickly follow up  
11 on what you said about the representativeness of a  
12 California population, I think that expanding to Southern  
13 California is a very interesting idea, in terms of having  
14 a collaboration already happening with Kaiser. But I  
15 would also like to have a discussion of how representative  
16 that is. I know that the initial plan for completely  
17 randomized population-based sample, such as NHANES, is not  
18 able to be carried out because of financial limitations.

19 But I think we have to be very clear and  
20 carefully evaluate how representative any populations that  
21 we look at are, and have that evaluated kind of  
22 explicitly.

23 CHAIRPERSON LUDERER: Dr. Bradman.

24 PANEL MEMBER BRADMAN: I just wanted to say I  
25 know I'm particularly interested in the screening that's

1 going on with the pesticides imidacloprid, glyphosate, and  
2 some of the other compounds that are under consideration.

3 So I think we're coming to the point though where  
4 we'd look at the list of suggested topics, we're kind of  
5 saying they're all potentially important and interesting.

6 I know, on an attention basis, I like the format  
7 where we have some information and discussion and a guest  
8 speaker. So to the extent that we have guest speakers to  
9 spread them out. And in a way, I think it helps with the  
10 flow of the meetings and kind of different -- requires  
11 different intellectual demands, and therefore, I think  
12 makes it interesting and more effective.

13 CHAIRPERSON LUDERER: Okay. It wasn't on.

14 Dr. DiBartolomeis.

15 DR. DiBARTOLOMEIS: This will give you a chance  
16 to think of some more things. But I actually want to go  
17 back to something that, Dr. Bradman, you raised about 20  
18 minutes ago, and I saw people nodding, maybe some  
19 agreement.

20 I'm seeking clarification. When you were talking  
21 about exposures in children, are you specifically saying  
22 that you'd like some more discussion in the future,  
23 presentations, or something along the lines of starting to  
24 biomonitor children or are you talking still about taking  
25 archived blood, for example, from cord blood or whatever,

1 and doing those kind of experiments. Because there is a  
2 big difference between getting samples that are collected  
3 through, you know, archive -- through genetic disease  
4 screening or whatever or even the MIEEP Program versus  
5 actually targeting children and doing that whole process  
6 of biomonitoring children. So I just wanted some  
7 clarification, so we can go back and talk about it.

8 PANEL MEMBER BRADMAN: I was really thinking  
9 about the former, actually considering studies or  
10 biomonitoring to go out and collect samples from young  
11 children. Pregnant women and young children are obviously  
12 kind of a priority in terms of vulnerability. We have the  
13 MIEEP study.

14 There's a few studies around the State that have  
15 collected samples from kids. But, in general, I think  
16 when we think about a representative population in  
17 California, we shouldn't leave out, you know, the youngest  
18 and most vulnerable. EPA NHANES had the lowest age group  
19 of 6 to 11. But I think if we were to move forward and do  
20 any kind of representative sampling, it would be great to  
21 include a full age spectrum.

22 CHAIRPERSON LUDERER: Dr. Quintana.

23 PANEL MEMBER QUINTANA: This is something that's  
24 not even on the sheet of that huge long list of things,  
25 but I've been trying to talk to everyone I meet about the



1 public, what would the public be interested in this kind  
2 of Program doing? I was asking them just to get a feeling  
3 for everyone I run into, moms or whatever. What are  
4 areas, are they plastics, like phthalates, are they  
5 pesticides, what areas do people I run into are they most  
6 interested in?

7           And I just wanted to bring up, not necessarily  
8 make it a topic for discussion, unless other people are  
9 interested, but what I hear over and over again from  
10 everyone I talk to -- and maybe this is a very  
11 California-specific exposure, but they want to know about  
12 diet? They want to if I'm a vegan, do I have lower levels  
13 of persistent pollutants in my body? You know, if I'm a  
14 vegetarian is it lower? Are there lower pesticides if I  
15 eat organic? And that's what I hear a lot is looking at  
16 diet specifically just.

17           So since I'm asking people what they want to  
18 hear, I told them I'd bring it back to this Panel and tell  
19 you guys that's what I'm hearing.

20           CHAIRPERSON LUDERER: Thank you for doing that.

21           Other ideas for 2015 from the Panel or do you  
22 think you have gotten enough feedback from us? Is there a  
23 specific thing you'd like us to address that we haven't  
24 yet?

25           MS. HOOVER: I mean, I think like what you were

1 all saying is the list we have is pretty good, and there's  
2 some additions. Just -- and given Dr. Fiehn's comment  
3 about having perspective on the overall look, but a couple  
4 years ago when we asked if there was any interest in  
5 potential priority chemicals, we were asked to do this  
6 excerpt of what designated chemicals are not yet  
7 priorities. So we included that. And I just -- we heard  
8 from the public that VOCs is on -- you know, has been  
9 commented on as something to move to priority.

10 So I would kind of like to get a sense from the  
11 Panel about of those that are designated, are there any  
12 others that you'd like us to potentially bring to you as  
13 potential priority, you know, in the face of limited  
14 resources and so forth, always having that context in the  
15 background? And do you -- you know, what's your -- what's  
16 the Panel's comment about VOCs. We heard a little bit  
17 about, you know, concerns about VOCs.

18 But in terms of scheduling time, you know, having  
19 an item on potential priority chemicals, are there  
20 particular things on this list that strike you as Panel  
21 members?

22 CHAIRPERSON LUDERER: I think -- I mean, maybe I  
23 could speak, I think several Panel members agreed that  
24 discussing VOCs as a potential priority class, given the  
25 interest and the ubiquity of the exposures, correct me I'm

1 wrong, if I'm misinterpreting what they said, but I think  
2 there was interest among the Panel members for doing that,  
3 and, you know, with the acknowledgement that some VOCs are  
4 already on the designated list. And obviously, that's not  
5 VOCs as a class. It's only those VOCs.

6           So that might be another point for discussion, I  
7 suppose, would be whether the Panel would recommend VOCs  
8 as a class as opposed to the way it is now, where it is  
9 compound by compound. And I don't know what other Panel  
10 members think about that, but it's sort of two different  
11 things.

12           Dr. Fiehn.

13           PANEL MEMBER FIEHN: Well, obviously, VOCs refer  
14 to a physical chemical property, which is very broad. You  
15 know, so we discussed today about the nitro-PAHs, and, you  
16 know, obviously, they're very volatile. And so, you know,  
17 then we discussed particulate matter with -- you know,  
18 to -- you know, so there is -- it's very difficult, I  
19 think, technically and even philosophically, I guess. You  
20 know, because they're -- you know, from ethylene to  
21 nitro-PAHs, there's a huge span, and it's demanding.

22           But discussing yes, but I'm not sure if -- right  
23 now, I would not be sure if it's wise to then say, you  
24 know, just general VOCs, you know, because they're too  
25 different.

1           CHAIRPERSON LUDERER: Dr. Schwarzman.

2           PANEL MEMBER SCHWARZMAN: What I heard in the  
3 request from the public that we got was that it was mainly  
4 VOCs that are involved -- or to which people are exposed  
5 because of gas exploration. And so if we were wanting to  
6 be responsive to that request, if we felt like that was  
7 something that we wanted to consider, maybe that's a way  
8 to narrow that focus is -- that's what I heard in that  
9 request, is that it was mainly about exposures in  
10 communities where there's current gas exploration and  
11 drilling.

12           And then I had a separate comment, if I could,  
13 just in terms of highlighting chemicals on the list of  
14 designated chemicals that haven't been prioritized yet. I  
15 would sort of echo Dr. Bradman's interest in pesticides,  
16 and add my own about phthalate alternatives. Kind of  
17 adding to my earlier comment about wanting to include  
18 classes of compounds. And I think the tendency to look to  
19 not just what's in a class, but what's being used as the  
20 alternative is very important.

21           CHAIRPERSON LUDERER: Dr. Quintana.

22           PANEL MEMBER QUINTANA: I'd like to second that.  
23 I heard that several -- many times from the members of the  
24 audience as well that it's the substitutes and this  
25 complete -- constantly changing world that's important.

1 So maybe we could think of classing them by use, in a way  
2 making it quite broad to make sure we're catching all  
3 those substitutes, when we're considering these agents.

4 Because they are moving new chemicals in all the  
5 time, flame retardants, and phthalate substitutes, as you  
6 say, so I'd like to second that comment.

7 CHAIRPERSON LUDERER: Dr. Schwarzman.

8 PANEL MEMBER SCHWARZMAN: This is a question,  
9 just because I haven't been involved in these discussions  
10 very much to date. What's the role of considering the  
11 function of a chemical, which is something that you just  
12 sort of mentioned, like plasticizer, as in -- as we seek  
13 to define classes of chemicals?

14 I mean, for some functional uses that would be so  
15 broad as to be not helpful. But I wonder if there are  
16 some functional uses where looking at how a chemical is  
17 used, rather than the compound itself, and the class of  
18 chemically related compounds would be useful.

19 CHAIRPERSON LUDERER: Yeah. I mean, I think the  
20 flame retardants are one example where we're kind of -- I  
21 mean, we're grouping them by structurally related flame  
22 retardants, but, yeah.

23 PANEL MEMBER SCHWARZMAN: But they're selected  
24 because they're being used as flame retardants. Yeah. I  
25 think -- we may think a little bit more about which other

1 functional uses like that would be relevant. And I think  
2 phthalates may be or plasticizers may be one example.

3 CHAIRPERSON LUDERER: Dr. Quintana.

4 PANEL MEMBER QUINTANA: I had a question for  
5 Sara, so it's good you're coming up, or Laurel. I think  
6 sometime ago, I sent you -- there was a paper that came  
7 out within the last six months on potential biomarkers for  
8 chemicals associated with breast cancer risk.

9 MS. HOOVER: Yeah.

10 PANEL MEMBER QUINTANA: And I believe I sent you  
11 that paper. And I was wondering if we have formally  
12 compared the list of chemicals in that paper against what  
13 we actually measure and discuss what isn't on there, I  
14 guess?

15 MS. HOOVER: So you actually raised that I think  
16 in July and raised it as an interesting point as part of  
17 our systematic review. So that is in -- you know, that's  
18 in our group of things to look at as part of our  
19 systematic review, yes. So we'll be doing that.

20 I did want to bring it back also to Laurel noted  
21 that things we have planned for 2015, which seems to  
22 resonate with people already, is PFASs as a class, and  
23 phthalates as a class. So it sounds like Panelists are on  
24 board with that.

25 We have limited, you know, ability to do much

1 more than that. And one of the reasons, just to really  
2 emphasize why we would raise those up, is because of a  
3 realistic ability from the lab to build on existing  
4 methods. So that is one kind of criterion, when we screen  
5 possible chemical selection.

6 So after say phthalates as a class, PFCs as a  
7 class, I heard like pesticides is an important thing to  
8 pull out potentially down the road for our next set of  
9 candidates. But anything else just sort of in your list  
10 of as we go down for say new designated chemicals, are  
11 there particular other things you'd want us to slot under  
12 those two that we've picked out as our 2015 priorities.  
13 This is for potential -- considering as a potential  
14 designated chemical. That was on Laurel's slide. It's  
15 also on your list.

16 CHAIRPERSON LUDERER: Any designated chemicals  
17 that are not current, so basically new designated  
18 chemicals?

19 Actually, one of the -- this is related, I think,  
20 to the discussion that we had about cosmetics at the last  
21 meeting. But I think it would be very interesting to hear  
22 about additional classes of musks, the fragrance -- we  
23 already talked about -- I mean, we had already designated  
24 I think some of the synthetic musks. And so this was to  
25 talk about the alicyclic and macrocyclic musks. I would

1 be interested in that. I think -- other comments from  
2 Panel members?

3 Well, we're about at the time that we had  
4 allotted for this topic. Is there more Public Comment  
5 or --

6 MS. HOOVER: No.

7 CHAIRPERSON LUDERER: Next item. All right. So  
8 our next agenda item is, as I mentioned earlier, is that  
9 we have a letter that the Scientific Guidance Panel  
10 discussed writing a letter of support for the  
11 Biomonitoring California Program, in particular supporting  
12 maintaining funding for the Program. And so we wanted to  
13 take this time now to pass around the final copy for Panel  
14 members to sign.

15 So we can start at one end here, and -- do you  
16 want to pass it down to the -- maybe to the end and we can  
17 just go down, or sign it as you go.

18 So the recommendation that the Panel should  
19 I -- is making -- do you have a pen? The Scientific  
20 Guidance Panel is recommending that State funding for  
21 Biomonitoring California be increased to provide an  
22 ongoing commitment of total funding equivalent to what the  
23 funding has been over the last five years from both the  
24 CDC sources, the CDC funding, as well as the State  
25 baseline funding, because we're really afraid that if the



1 funding decreases, as it has, that the impressive gains  
2 that are made by the Program during the last five years  
3 might not be sustainable, and we think that would be a  
4 real tragedy.

5 And then while we're signing, I can also maybe  
6 announce at this point that there are 10 minutes allotted  
7 for open public comment period, and ask whether there are  
8 any members of the public who wish to make a comment  
9 during the open comment period?

10 No.

11 And I can also announce while we're signing, that  
12 the transcript of this meeting is going to be posted on  
13 the California -- the Biomonitoring California website  
14 when available, as is done after every meeting. And also  
15 to remind everyone that our next, as was presented in one  
16 of the slides earlier, that the next SGP meeting is going  
17 to be on March 13th, 2015. And that will be in Oakland.  
18 The next two meetings will be in Oakland.

19 All right. I think we're almost done. And I  
20 would like to thank everyone for coming and staying till  
21 the end of the day. And I think we had a really  
22 interesting set of presentations today, great discussion,  
23 and we're all looking forward to the next meeting.

24 And I think we have our last person signing the  
25 letter, so I think we can adjourn the meeting with that.

1 And thank you, everyone, and have a safe trip home.

2 (Thereupon the California Environmental  
3 Contaminant Biomonitoring Program, Scientific  
4 Guidance Panel meeting adjourned at 4:38 p.m.)  
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## 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  
License No. 10063