

**Summary Minutes of the Clean Air Scientific Advisory Committee (CASAC) Particulate Matter Review Panel Public Teleconference
February 3, 2004, 11:00 AM – 2:00 PM Eastern Time
Ariel Rios Building, Washington D.C.**

Panel Members: See Panel Roster – Appendix A

Date and Time: Tuesday, February 3, 2004, 11:00 AM – 2:00 PM Eastern Time

Location: Ariel Rios Building, 1200 Pennsylvania Ave., N.W., Washington, DC.

Purpose: The purpose of this teleconference meeting was for the CASAC PM Review Panel to discuss follow-on matters related to its ongoing peer review of the EPA Air Quality Criteria Document for Particulate Matter (Fourth External Review Draft. Specifically, the Panel deliberated on the major revisions (December 2003) to Chapters 7 (Toxicology of Particulate Matter in Humans and Laboratory Animals) and 8 (Epidemiology of Human Health Effects Associated with Ambient Particulate Matter) of this draft document.

Attendees: Chair: Dr. Philip Hopke

CASAC Members: Dr. James Crapo
Dr. Frederick Miller
Mr. Richard Poirot
Dr. Frank Speizer
Dr. Barbara Zielinska

Consultants: Dr. Jane Keonig
Dr. Petros Koutrakis
Dr. Allan Legge
Dr. Paul Lioy
Dr. Morton Lippmann
Dr. Roger McClellan
Dr. Gunter Oberdorster
Dr. Sverre Vedal
Dr. Warren White
Dr. George Wolff

EPA SAB Staff: Mr. Fred Butterfield, CASAC DFO
Dr. Vanessa Vu, SAB Staff Office Director
Dr. Tony Maciorowski, SAB Acting Associate Director
for Science
Mr. Rich Albores, SAB Acting Deputy Director

Other EPA Staff:

Tim Benner, U.S. EPA, ORD, OSP
James Brown, U.S. EPA, ORD, NCEA-RTP

Gerry Gleason, U.S. EPA, OGC
Barbara Glenn, U.S. EPA, ORD, NCER
Les Grant, U.S. EPA, ORD, NCEA-RTP
John Hannon, U.S. EPA, OGC
Karen Martin, U.S. EPA, OAQPS
Harvey Richmond, U.S. EPA, OAQPS
Mary Ross, U.S. EPA, OAQPS
Steve Silverman, U.S. EPA, OGC
Jim Vickery, U.S. EPA, ORD, NERL
William Wilson, U.S. EPA, ORD, NCEA-RTP

Others participating:

Mr. Cass Andary, Alliance of Automobile Manufacturers
Jeanette Clute, Ford Motor Co.
Robert Connery, Holland & Hart, LLP
Denise Kennedy, Holland & Hart, LLP
Lisa Herschberger, Minnesota Pollution Control Agency
John Heuss, Air Improvement Resource, Inc.
Kyle Isakower, American Petroleum Institute
Cindy Langworthy, Hunton & Williams, LLP
Fred Lipfert, private citizen
Dr. Suresh Moolgavkar, Sciences International, Inc.
Will Ollison, American Petroleum Institute
Michael Reale, DaimlerChrysler Corporation
James Ryan (on behalf of Kurt Blase), O'Connor and Hannan
Deborah Shprentz, American Lung Association
Joe Suchecki, Engine Manufacturers Association
Tamara Thies, National Cattlemen's Beef Association
Megan Tipton, National Cattlemen's Beef Association
Dr. Peter Valberg, Gradient Corporation
Dr. Jaroslav Vostal, private citizen
Dr. Ferdinand Venditti, Albany [NY] Medical College

Meeting Summary

The discussion followed the issues and general timing as presented in the meeting agenda (Appendix B).

TUESDAY, FEBRUARY 3, 2004

Convene Meeting, Call Attendance, Introduction and Administration

Mr. Fred Butterfield, Designated Federal Officer (DFO) for the CASAC, opened the teleconference, called attendance, and welcomed all attendees. He noted that the CASAC is a

Federal Advisory Committee chartered under the Federal Advisory Committee Act (FACA) to provide advice and recommendations to the EPA Administrator. Consistent with FACA regulations, its deliberations are held as public meetings and teleconferences for which advance notice is given in the *Federal Register*. The DFO is present at all such meetings to assure compliance with FACA requirements. Meeting minutes were taken (by the DFO) for this teleconference. The minutes will be certified by the Panel Chair and made available on the SAB website. All Panel members have submitted financial conflict of interest information, which was reviewed by a SAB staff member prior to the teleconference and found to be satisfactory.

Dr. Vanessa Vu, SAB Staff Office Director, thanked the Chair and members of the CASAC PM Review Panel for their efforts and advice to the Agency on this document. She also thanked the Dr. Les Grant, Director of the National Center for Environmental Assessment (NCEA)–RTP and the DFO.

Purpose of Meeting

Dr. Phil Hopke, CASAC Chair, introduced new Clean Air Scientific Advisory Committee member Dr. James Crapo of the National Jewish Medical and Research Center in Denver, CO. In addition, Dr. Hopke announced that Dr. Ellis Cowling, University Distinguished Professor at-Large at North Carolina State University in Raleigh, NC, had accepted appointment to the CASAC and would be officially joining the Committee shortly.

Dr. Hopke noted that, per the approach agreed-upon at the Panel's August 25-26 meeting, PM Review Panelist and CASAC Member Dr. Fred Miller had been working directly with NCEA staff to ensure that the appropriate technical modifications and other minor corrections were made to Chapter 6 (Dosimetry) of the PM AQCD. Both Dr. Hopke and Dr. Miller commented that Chapter 6 was now in "good shape."

Dr. Hopke stated that the focus of this teleconference was on the revised (December 2003) draft Chapters 7 (Toxicology) and 8 (Epidemiology) of the fourth external review draft AQCD for PM. He also noted that completion of the re-write of Chapter 9 (Integrative Synthesis) by the NCEA-RTP staff is contingent on the Panel wrapping-up its review of Chapters 7 and 8. The goal of today's teleconference is to work-through Chapters 7 and 8, with a view toward having the next face-to-face meeting at the end of March 2004 in Research Triangle Park, NC (RTP).

Summary Presentation on Major Revisions to Chapters 7 (Toxicology) and 8 (Epidemiology) of 4th External Review Draft of EPA's AQCD for Particulate Matter

Dr. Les Grant gave a summary of the major revisions to Chapter 7 and 8 of the draft PM AQCD. (These are summarized in bullet format in Appendix C.) Dr. Grant also noted that there were some editing errors inadvertently introduced into the new Appendix 7A on dosimetric modeling that will need to be corrected. Finally, Dr. Grant stated that NCEA had completed their revisions to Chapter 6 (Dosimetry) by incorporating the changes requested by Dr. Miller.

Public Comment Period re: Chapters 7 and 8 of the PM AQCD

Mr. Butterfield began the public comment period and reminded speakers to keep their statements to no more than three minutes, particularly those who had already submitted written comments (see Attachment D for a list of all public speakers).

Dr. Ferdinand Venditti (Albany [NY] Medical College) for the Engine Manufacturers Association (EMA)

Dr. Venditti congratulated EPA on a job well done with respect to addressing his prior concerns. Nevertheless, he asked the Agency to revisit especially at Section 8.3.1 relating to cardiovascular hospital admissions, noting that this section appears to state that there is no effect of PM on the frequency of these admissions. Dr. Venditti commented that up to fifty percent (50%) of these admissions might well be scheduled hospital admissions that driven by non-PM factors. In other words, there are a full host of factors that would not be driven by environmentally-related PM changes that drive a significant proportion of hospital admissions for cardiovascular causes.

Therefore, EPA should consider adding a caveat with respect to three of these studies that do not show a relationship between PM and acute or emergent admission for cardiovascular causes. Dr. Grant noted that NCEA has evaluated this comment, and indeed the studies do appear to have taken this into account; in the current CD text, it is clear that added at least four of the studies are already identified as having used only emergency, or unscheduled, hospital admissions in their analyses. CASAC panel member Dr. Sverre Vedal agreed and added that he thinks most epidemiologists have considered this in conducting their studies and focused on unscheduled admissions showing positive PM effects with respect to hospitalizations.

Mr. Robert Connery and Ms. Denise Kennedy (Holland & Hart LLP) for the National Cattlemen's Beef Association

Mr. Connery noted that Holland & Hart LLP has filed written comments with the PM Review Panel which are not attached to these minutes. Notes that National Cattlemen's Beef Association is an industry that cannot meet the coarse PM standard adopted the first time around or even a multiple of those standards. At issue is whether the scientific evidence warrants prohibiting our industry's operation even after best-available control practices.

Mr. Connery noted that the existing Chapters 7 and 8 essentially have not been changed to incorporate their previously-submitted comments, especially that the science is not sufficient to support the adoption of a coarse PM standard at this time (although he acknowledged that there is some evidence that make the subject worthy of continued study). In addition, Mr. Connery cited remarks he attributed to Dr. Karen Martin of EPA's Office of Air Quality Planning and Standards (OAQPS) at the Panel's November 2003 meeting with respect her understanding of the controlling legal opinion, *i.e.*, that if this Panel does not act, then the old 1987 PM₁₀ standard will "spring back into effect." Mr. Connery commented that he does not feel that this is necessarily the case, and that, rather, the Agency has greater discretion to deal with that.

Dr. Hopke noted, as a point of clarification, that the CASAC PM Review Panel does not set standards; rather, the Panel reviews documents and comments on the science and the use of the science by the Agency. It is the Agency that makes decisions with regard to the nature of the ultimate standards that it is going to propose.

Dr. Peter Valberg (Gradient Corporation) for EMA

Dr. Valberg remarked on the interpretive summary of Chapter 7 and in particular on the issue of extrapolating doses of PM from laboratory rats to equivalent air concentrations in humans. Some of the text appears to suggest that achieving “does equivalency” between humans and rats always requires considerably a higher PM exposure concentration in rats than in humans, and that while this may be true in certain lung compartments and under certain exposure scenarios, the appropriate caveats are really not made clear in that section and should be provided.

In addition, Dr. Valberg noted that, in calculating “does equivalency,” it only really makes sense only in the context of specific aerosol constituents and specific health endpoints. The bottom line in “dose equivalency” is that you can’t calculate it without carefully considering the aerosol constituent and the potential health point of interest.

Finally, he commented on the relative susceptibility of the rat versus the human. Statements in Appendix 7A leave the impression that the human is more sensitive to inhaled particles than rats, whereas at least for some aerosols the available evidence suggests that the opposite result is true.

CASAC member Dr. Fred Miller noted that many of Dr. Valberg’s comments were well-taken.

Dr. Suresh Moolgavkar (Sciences International) for the PM Fine Coalition

Dr. Moolgavkar noted that he has provided detailed written comments on Chapter 8 with the PM Review Panel which are not attached to these minutes. He commented that, while there had been substantial revisions to the Chapter 8, he still feels as if the conclusion reads as if the concerns raised about the “considerable dissonance” do not, in the final analysis, matter at all. He cited a number of examples of “unmistakable bias,” which he documents in-depth in his written comments.

The literature since 1996 continues to show considerable “dissonance,” with some studies reporting associations between PM and health effects and others failing to find such associations. Specifically, Dr. Moolgavkar noted that, generally, as better statistical methods have been used for analyses of time-series studies, the magnitude and the strength of the reported associations have become smaller. Particularly, he cited the reanalyses prompted by the S-Plus convergence problems. He noted that the NMMAPS results themselves suggest considerable heterogeneity of PM associations with mortality across the various cities, and of the 90 cities examined, PM is positive and significantly-associated in only two of the cities. Furthermore, Dr. Moolgavkar commented that he was “astounded” that the single-city results were not taken into account in NMMAPS.

CASAC PM Review Panelist Dr. Sverre Vedal noted that the revised Chapter 8 does reflect improvement in harvesting and life-shortening issues.

Mr. Cass Andary of the Alliance of Automobile Manufacturers (AAM)

Mr. Andary noted that the previous comments submitted on behalf of the AAM are not reflected as appropriate changes to these two chapters. Furthermore, he expressed concern that the process does not allow sufficient opportunity for public comments to be reflected. He cited as one illustrative example the comparisons of three of the cohort studies in Table 8-14 and 8-15, where the ASHMOG male results — but not female — are not shown, leaving a misleading impression about the consistency of these results.

AAM has a list of other issues that are more complicated and fundamental to the underlying science, and he would be happy to provide that list to the Panel upon request (although these were included in the written comments which are not attached to these minutes). Mr. Andary's general conclusion is that many of the scientific comments have not been considered in the revisions to the PM air quality criteria document, and that the process itself may not allow for meaningful consideration of the public comments.

Mr. Jon Heuss (Air Improvement Resource, Inc.) for General Motors Corporation

Mr. Heuss stated that the appendix to Chapter 7 does not respond to the CASAC's request, in that it is misleading to compare rats at rest to just the extreme value of human exposure. He recommended that the Agency either substantially re-do Appendix 7A — “under CASAC Supervision” — or else delete it. In addition, despite years of research, Mr. Heuss noted that there are still no toxicology data showing effects from manmade PM at ambient levels; and, further, that all PM is not equally-toxic by mass.

Mr. Heuss then noted a different problem in Chapter 8, that is, how to interpret positive effects in epidemiological studies. He cited several studies, noting several specific types of biases, which combine to overstate the magnitude and consistency of the PM association. Mr. Heuss states that the Agency needs to look at the pattern of results in four major systematic analyses. Finally, he notes that he raised additional issues of facts and interpretation in his written comments (which are not attached to these minutes), and the PM AQCD should acknowledge and reflect these concerns.

Dr. Fred Lipfert

Dr. Lipfert spoke as an “aggrieved author” with respect to the Agency's treatment of the two studies that he authored; the Veteran's Cohort (VA) Study (published in 2000 and 2003), and the infant mortality study of 2000. Dr. Lipfert's specific comments were provided in writing and are provided as Appendix E.

CASAC PM Review Panelist Drs. Roger McClellan and Paul Liroy commented that the “system” needs to allow and ensure that EPA adequately considers all public comments, noting that they

perceive a lack of responsiveness on the part of the Agency. Dr. Grant countered that NCEA does, in fact, consider virtually all the public comments than the Agency receives, making “quite an effort” to go through all of them (*e.g.*, the previously-submitted comments on cardiovascular effects). However, Dr. Grant also noted the need to prioritize and focus on specific comment sets, in view of the tight time constraints in the process.

Summary of CASAC PM Review Panel Discussion and Deliberations re: the AQCD for PM

Chapter 7 (Toxicology)

CASAC PM Review Panelists noted, in general, that these latest revisions have resulted in significant improvements to this chapter, especially with respect to cardiovascular studies. However, there is still room for improvement regarding the chapter’s treatment of the toxicology of bioaerosols, in that there is no “bottom line” relative to the interpretation of PM studies and the regulatory implications of bioaerosols for PM_{10-2.5} or PM_{2.5} standards. Furthermore, the Panel welcomed the addition of more exposure data throughout the chapter, but noted that some studies remain for which this information is still lacking and therefore needs to be included.

Several Panelists noted significant errors with the new appendix to Chapter 7 — specifically, that while it makes a good start on the extrapolation of rat to human doses, it does not yet achieve the goal of providing clear comparisons of rat and human doses. Moreover, EPA needs to improve the description of the model parameters and exposure conditions (*e.g.*, moderate work *vs.* resting) on which extrapolations are based. Additionally, the Panel noted that Appendix 7A suffers from “information overload” in the tables, and concluded that Appendix 7A will require major re-writing.

One Panelist expressed serious concerns, noting that the chapter is still “not a scientifically adequate review and evaluation of the relevant scientific literature on the toxicology of particulate matter” required to provide scientific criteria for establishing the PM NAAQS. This Panelist also comments specifically that the review and evaluation of recent literature in the chapter is biased because of the “heavy dependence” or over-reliance on EPA’s recent research on a single type of PM, *i.e.*, residual oil fly ash (ROFA). The Panel noted that ROFA is unique in its toxic properties and therefore not representative in toxicity or mode of action of many other kinds of PM. Dr. Grant acknowledged that ROFA needs to be put in a broader context.

Similarly, with respect to concentrated airborne particles (CAPs), Panelists noted that these are not well-defined materials, and vary both from location to location as well as temporally within a given location. Thus, CAPs are not useful in providing the reproducible exposures typically found in toxicological studies, but do provide exposures to real-world particles.

Finally, the Panel noted that it was essential that Chapter 7 provide clearer documentation of scientific conclusions with regard to toxicological mechanisms that have been identified in laboratory studies, which will then be incorporated into the revised integrative synthesis (Chapter 9), which is still forthcoming. Other, relatively minor technical and editorial comments on Chapter 7 are reflected in CASAC PM Review Panelists’ detailed, individual review comments

which will be compiled in the appendix to the Panel's forthcoming consensus report from this teleconference meeting.

Chapter 8 (Epidemiology)

The lead reviewer for Chapter 8 on the Panel stated that this revision represents the single best incremental improvement that he has seen to date. He noted that it is more even-handed and immensely improved. Nevertheless, he still cited some "disheartening aspects" of the revision, with some relatively minor points still not addressed and some mistakes in need of correction.

Specifically, he commented on a lack of "evenhandedness" "in the chapter's presentation of interpretations of some of the findings of, for example, time-series studies of hospitalizations when they go against what he regards as the preferred interpretation. In other words, how are the mortality and morbidity impacts represented? This Panelist cited various studies and admitted that these were difficult to interpret. Therefore, the Agency should take care in how it attempts to do so. Finally, this lead Chapter 8 reviewer mentioned the cohort studies, noting that some studies are weighted more than others and commenting that "a better job needs to be done to justify discounting the findings from the AHSMOG and Veterans study." He also cited a "somewhat mixed message" from the multi-city studies, especially NMMAPS.

Another Panelist mentioned the need to discuss the nature of populations in the cohort studies — particularly the ACS and Harvard Six-Cities studies, and that there was no discussion of updates to the ACS study, *i.e.*, Hoek *et al.* Panel members also noted that references to several other studies (Dublin and Hong Kong) were missing, and, with respect to the discussion of thresholds in Chapter 8, there appears to be a bias or presumption of linearity even when the data indicates otherwise.

Still another member of the PM Review Panel remarked that while there is a "growing body of studies" that demonstrate a significant positive relationship between PM and mortality, there are similarly a growing number of epidemiology studies "that show no effect or implicate one or more of the other criteria pollutants or PM_{10-2.5}." He also cited an article from the literature in which it is argued that "the results of a single time series model should not be trusted" — adding that because this article is "potentially a show stopper," it merits some discussion in Chapter 8 of the PM AQCD. Finally, this Panelist questions the "weight of evidence" with respect to the four chronic PM exposure studies discussed in the AQCD which show contradictory results.

The Panel concluded that this revision to Chapter 8 is substantially improved over the previous draft. Specifically, the overview of the key methodological issues is now better focused and directed toward the particular issues that are covered in the chapter, rather than serving more as a "textbook orientation" of epidemiology — thus making the chapter more relevant and readable. However, in the chapter's treatment of confounding and effect modification, the Panel suggested that there should be reference to the more extensive discussion of the problem of exposure misclassification.

Furthermore, while there is now some discussion in Chapter 8 of revised generalized additive model (GAM) individual-city studies, the Panel felt that the discussion of the changes in risk

estimates arising from the revised GAM analyses presented the results in a somewhat confusing manner. Finally, as with Chapter 7, other specific remarks are provided in Panelists' detailed, individual review comments which will be compiled in the appendix to the Panel's report from this meeting.

Summary, Wrap-up, Next Steps and Closing Remarks

The Panel agreed that Chapter 6 (Dosimetry) is considered closed. It was the consensus of the Panel that Chapters 7 (Toxicology) and 8 (Epidemiology) are substantially improved, but that they still require further revision in order to provide an appropriate summary of the science in these two areas. The Panel's consensus comments on these two chapters will be summarized in its forthcoming report, and the individual review comments of Panel members will be presented in an appendix to that report. Dr. Hopke asked the Panel members to submit any final comments as soon as possible to both himself and Mr. Butterfield.

In addition, Dr. Grant stated that both the revised Chapters 7 and 8 and the re-written Integrative Synthesis chapter (Chapter 9) should be made available to the CASAC PM Review Panelists for review and comment by late February 2004. Therefore, it was noted by Dr. Hopke that the dates of March 30-31 appeared to be the best prospective dates for the next face-to-face meeting of the PM Review Panel to review the revised Chapters 7 through 9 of the PM AQCD. Accordingly, Mr. Butterfield asked all Panelists to inform him as soon as practicable if these dates would not work with their schedules.

(Update: Since the date of this teleconference, Dr. Les Grant's staff had continued to update the revised Chapters 7 and 8 of the PM AQCD and to develop a new Integrative Synthesis chapter. NCEA will release these three chapters to the public and the Panel for a public comment period as soon as possible. However, this will now most likely occur sometime in April. Discussions with the PM Review Panel subsequent to the February 3 teleconference focused on April 28 and 29 as alternate prospective dates for the next PM Review Panel Meeting in RTP. Nevertheless, while these latest dates represented as reasonable a timeframe for a face-to-face meeting as Agency staff were able to predict, it is now unlikely that the updated Chapters 7 through 9 will be released sufficiently in advance of mid-April to make an April 28-29 face-to-face meeting of the PM Review Panel worthwhile. Therefore, Panelists have recently been asked to indicate to the DFO all dates in May and June 2004 that they presently would be available for a prospective two-day meeting in RTP.)

Action Items:

- Panel members are requested to send their individual review comments on the revised Chapters 7 and 8 to Mr. Butterfield as soon as possible [Completed].
- Dr. Hopke will prepare and circulate a draft consensus report from the Panel on this meeting within two weeks of the date of this teleconference [Completed].
- Dr. Grant's staff will continue to update the revised Chapters 7 and 8 of the PM AQCD and to develop a new Integrative Synthesis chapter (Chapter 9), and NCEA will provide these revised chapters back to the Panel by the end of February 2004. [The date for this

had slipped until April 2004, and NCEA will now release these three chapters to the public and the Panel at that time for an additional public comment period.]

Respectfully Submitted:

Certified as True:

/s/

/s/

Fred A. Butterfield, III

Philip Hopke, Ph.D.

Fred A. Butterfield, III
CASAC DFO

Philip Hopke, Ph.D.
CASAC Chair

APPENDICES

- Appendix A: Roster of the CASAC Particulate Matter Review Panel
- Appendix B: Teleconference Agenda
- Appendix C: Summary Guide to Major Revisions to Chapters 7 & 8 (December 2003) of 4th External Review Draft of EPA's Air Quality Criteria Document for Particulate Matter
- Appendix D: List of Public Speakers
- Appendix E: Public Comments: Dr. Fred Lipfert

Appendix A – Roster of the CASAC Particulate Matter Review Panel

**U.S. Environmental Protection Agency
Science Advisory Board (SAB) Staff Office
Clean Air Scientific Advisory Committee
CASAC Particulate Matter Review Panel***

CHAIR

Dr. Philip Hopke, Bayard D. Clarkson Distinguished Professor, Department of Chemical Engineering, Clarkson University, Potsdam, NY

Also Member: SAB Board

CASAC MEMBERS

Dr. James D. Crapo, Chairman, Department of Medicine, and Executive Vice President of Academic Affairs, National Jewish Medical and Research Center, Denver, CO

Dr. Frederick J. Miller, Vice President for Research, CIIT Centers for Health Research, Research Triangle Park, NC

Mr. Richard L. Poirot, Environmental Analyst, Air Pollution Control Division, Department of Environmental Conservation, Vermont Agency of Natural Resources, Waterbury, VT

Dr. Frank Speizer, Edward Kass Professor of Medicine, Channing Laboratory, Harvard Medical School, Boston, MA

Dr. Barbara Zielinska, Research Professor, Division of Atmospheric Science, Desert Research Institute, Reno, NV

CONSULTANTS

Dr. Jane Q. Koenig, Professor, Department of Environmental Health, School of Public Health and Community Medicine, University of Washington, Seattle, WA

Dr. Petros Koutrakis, Professor of Environmental Science, Environmental Health, School of Public Health, Harvard University (HSPH), Boston, MA

Dr. Allan Legge, President, Biosphere Solutions, Calgary, Alberta

Dr. Paul J. Liroy, Associate Director and Professor, Environmental and Occupational Health Sciences Institute, UMDNJ - Robert Wood Johnson Medical School, NJ

Dr. Morton Lippmann, Professor, Nelson Institute of Environmental Medicine, New York University School of Medicine, Tuxedo, NY

Dr. Joe Mauderly, Vice President, Senior Scientist, and Director, National Environmental Respiratory Center, Lovelace Respiratory Research Institute, Albuquerque, NM

Dr. Roger O. McClellan, Consultant, Albuquerque, NM

Dr. Günter Oberdörster, Professor of Toxicology, Department of Environmental Medicine, School of Medicine and Dentistry, University of Rochester, Rochester, NY

Dr. Robert D. Rowe, President, Stratus Consulting, Inc., Boulder, CO

Dr. Jonathan M. Samet, Professor and Chair, Department of Epidemiology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD

Dr. Sverre Vedal, Professor of Medicine, National Jewish Medical and Research Center, Denver, CO

Mr. Ronald H. White, Research Scientist, Epidemiology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD

Dr. Warren H. White, Visiting Professor, Crocker Nuclear Laboratory, University of California - Davis, Davis, CA

Dr. George T. Wolff, Principal Scientist, General Motors Corporation, Detroit, MI

SCIENCE ADVISORY BOARD STAFF

Mr. Fred Butterfield, CASAC Designated Federal Officer, 1200 Pennsylvania Avenue, NW, Washington, DC, 20460, Phone: 202-564-4561, Fax: 202-501-0582, (butterfield.fred@epa.gov) (FedEx: Fred A. Butterfield, III, EPA Science Advisory Board (1400A), Ariel Rios Federal Building North, Suite 6450, 1200 Pennsylvania Ave., NW, Washington, DC, 20004, Tel.: 202-564-4561)

* Members of this CASAC Panel consist of:

a. CASAC Members: Experts appointed to the statutory Clean Air Scientific Advisory Committee by the EPA Administrator; and

b. CASAC Consultants: Experts appointed by the SAB Staff Director to serve on one of the CASAC's National Ambient Air Quality Standards (NAAQS) Panels for a particular criteria air pollutant

Appendix B – Meeting Agenda

**U.S. Environmental Protection Agency
Clean Air Scientific Advisory Committee (CASAC) Particulate Matter (PM) Review Panel**

**Tuesday, February 3, 2004 – Public Teleconference Meeting
11:00 am to 2:00 pm Eastern Time
Ariel Rios Federal Building North – Conference Room 6013
1200 Pennsylvania Avenue, NW, Washington, DC 20460**

Teleconference Meeting for CASAC PM Review Panel Discussion of Follow-On Matters Related to its Review of EPA’s Air Quality Criteria Document (AQCD) for Particulate Matter (Fourth External Review Draft)

Final Meeting Agenda

Tuesday, February 3, 2004

11:00 am	Convene Teleconference; Call Attendance Introductions and Administration	Mr. Fred Butterfield, CASAC DFO
11:10 am	Purpose of Meeting	Dr. Phil Hopke, Chair
11:15 am	Summary Presentation on Major Revisions to Chapters 7 (Toxicology) and 8 (Epidemiology) of 4th External Review Draft of EPA’s AQCD for Particulate Matter	Dr. Les Grant, Director, National Center for Environmental Assessment (NCEA-RTP)
11:45 am	Public Comment Period	Mr. Butterfield Dr. Hopke
12:05 pm	CASAC PM Review Panelists’ Discussion	CASAC PMRP Members & Consultants
1:45 pm	Summary and Next Steps	Dr. Hopke
2:00 pm	Adjourn Meeting	Mr. Butterfield

Appendix C– Summary Guide to Major Revisions to Chapters 7 & 8 (December 2003) of 4th External Review Draft of EPA’s Air Quality Criteria Document for Particulate Matter

CHAPTER 7: TOXICOLOGY OF PARTICULATE MATTER IN HUMANS AND LABORATORY ANIMALS

- Chapter Introduction (Section 7.1) rewritten to provide more concise, clearer orientation to rest of chapter and new Appendix 7A on dosimetric modeling.
- Chapter reorganized to address in-vivo studies of PM cardiovascular effects (Section 7.2; pp. 7-5 to 7-27) before discussion of in-vivo studies of PM respiratory effects.
- New materials added at outset of new Section 7.2 to provide introduction/orientation to cardiovascular function parameters (and related electrocardiographic and blood chemistry indices) potentially affected by PM exposures.
- Extensive reordering of sequence of presentation of PM in-vivo cardiovascular toxicology studies in applicable Tables (7-1a, 7-1b) on Pp. 7-11 to 7-16 and provision of more information (in Tables 7-1a and 7-1b and associated text discussions) on PM exposure parameters (concentration, duration, etc.) associated with notable observed cardiovascular effects.
- Appropriate revisions made to discussion of individual PM cardiovascular toxicology studies, their findings, and/or overall conclusions, taking into account previous CASAC and public comments as well as inputs from independent cardiology expert consultant. Includes new caveats regarding (a) findings related to PM effects on electrocardiographic (ECG) and blood chemistry measures of cardiovascular status/function, and (b) potential implications of associated risk of serious cardiovascular outcomes (e.g., heart attack, stroke, etc.).
- A few additional new studies added to cardiovascular toxicology section, e.g., those by Kodavanti et al (2003) and Nadziejko et al (2002).
- Section 7.3 (Pp. 7-28 to 7-90) on PM Respiratory effects expanded to include more extensive coverage of certain topics, e.g., especially on ambient bioaerosols (Section 7.3.4; Pp. 7-61 to 7-90).
- Provision in Tables 7-2 a & b, 7-3 a & b, and 7-4 and associated text discussions of more information on PM exposure parameters (e.g., concentration, duration, etc.) associated with notable observed respiratory effects.
- Efforts made to clarify better diesel particulate matter (diesel PM) versus whole diesel exhaust (PM & gases) exposure/effects.

- Most notable revision to Section 7.4 (Pp 7-91 to 7-141) on PM in-vitro exposure toxicology studies is marked expansion of Section 7.4.2.3 on PM mutagenicity/genotoxicity effects (Pp 7-111 to 7-124). Includes bringing in discussions from EPA Diesel Document (2002).
- Section 7.6 (Pp 7-159 to 7-168) on responses to PM and gaseous copollutants has been resequenced to provide more logical flow of discussion.
- Summary Section 7.7 (Pp. 7-169 to 7-189) has been extensively revised to better reflect text coverage of topics and key findings/conclusions and to be more interpretive.
- New Appendix 7A (Pp. 7A-1 to 7A-22) on rat-to-human extrapolation modeling, has been added at end of Chapter 7 and is alluded to, as appropriate, in main body of chapter.

CHAPTER 8: EPIDEMIOLOGY OF HUMAN HEALTH EFFECTS ASSOCIATED WITH AMBIENT PARTICULATE MATTER

- Introductory materials (Section 8.1; Pp 8-1 to 8-17) revamped to a more understandable and shorter form. Includes rewrite of “text-book-type” discussion of confounding concepts and interpretation of analytic approaches.
- New Section 8.2.2.4 (Pp 8-48 to 8-52) added on U.S. single-city studies of short-term PM exposure-mortality relationships.
- Some new information and discussion added to section on long-term PM exposure-mortality effects, e.g., discussion of Lipfert et al (2003) follow-up paper on Veterans’ Cohort Study on P 8-106.
- Section 8.2.3.4 (Pp. 8-116 to 8-120) on PM-mortality intervention studies revised to add discussion of new studies by Clancy et al (2000) and Hedley et al (2002) in Dublin and Hong Kong, respectively.
- Section 8.3.1.3 (Pp 8-127 to 8-157) on new cardiovascular morbidity studies revamped as appropriate to take into account CASAC and public comments, as well as cardiology expert consultant inputs, on cardiovascular morbidity studies, their findings and overall conclusions. Includes, especially, revisions to Section 8.3.1.3.4 on studies of cardiovascular physiology and ensuing materials (Pp 8-146 to 8-157).
- Section 8.4 on interpretive assessment of epidemiologic evidence revamped and shortened. Includes, of particular note, expanded discussion and graphic depiction (in new Figures 7-18 to 7-21; Pp 8-226 to 8-229) of multi-pollutant model results for selected key single-city and multi-city studies of PM results for PM-only models versus PM effect changes in multi-pollutant models.

- Evaluation of NMMAPS results revamped in Section 8.4 to more clearly reflect outcomes of GAM reanalyses as they pertain to issue of heterogeneity of effects. Note also made of “reopening” by GAM reanalyses of model specification issues, e.g., potential confounding by weather.
- Materials regarding age-related differences in PM effect estimates added in Section 8.4.8 (Pp 8-261 to 8-262).
- In Section 8.5 summary materials, addition to bullet 16 (P. 8-294) of comments/conclusion regarding intervention studies.

Appendix D – List of Public Speakers

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**U.S. Environmental Protection Agency
Clean Air Scientific Advisory Committee (CASAC)
Particulate Matter (PM) Review Panel Teleconference**

***Purpose – Ongoing Review of the 4th External Review Draft of
Air Quality Criteria Document (AQCD) for Particulate Matter***

February 3, 2004

EPA Headquarters – Ariel Rios Building, 1200 Pennsylvania Ave., N.W., Washington, DC

#	Speaker's Name	Organizational Affiliation	Organization(s) Represented
1	Dr. Ferdinand Venditti	Albany [NY] Medical College	Engine Manufacturers Association (EMA)
2	Mr. Robert Connery & Ms. Denise Kennedy	Holland & Hart LLP	National Cattlemen's Beef Association
3	Dr. Peter Valberg	Gradient Corporation	EMA
4	Dr. Suresh Moolgavkar	Consultant	Sciences International, Inc.
5	Mr. Cass Andary	Alliance of Automobile Manufacturers (AAM)	Same
6	Mr. Jon Heuss	Air Improvement Resource, Inc. (AIR)	General Motors Corporation (GMC)
7	Dr. Fred Lipfert	environmental consultant	none (speaking on behalf of himself)

Appendix E – Public Comments: Dr. Fred Lipfert

Remarks of Dr. Frederick W. Lipfert during the CASAC teleconference, Feb. 3, 2004 (representing himself)

Good morning, everyone. Thanks for the opportunity to air some grievances regarding the treatment that my publications have received in Chapter 8. Please note that I'm speaking only for myself here. The papers of greatest concern involve the Veterans Cohort (VA) Study, published in 2000 and 2003, and the infant mortality study of 2000. Both projects were sponsored by EPRI, who has not cleared these remarks. This written version is provided following CASAC's request.

The VA study is incorrectly described in the CD (p. 104), using language identical to what I complained about in the previous draft. The CD authors are apparently not listening.

In addition to these errors of commission, there are also errors of omission. VA finds positive effects for NO₂ and ozone and negative effects for CO that are robust to modeling methods (which the CD ignores).

In contrast, the VA estimates for PM_{2.5} and SO₄ depend strongly on the modeling methods used and are mostly negative, which the CD blames on the interaction terms in the model (p. 105). This is clearly not the case, as shown in the 2003 paper but not mentioned in the CD.

The VA study gets only one line in Table 8-11, even though the study is larger and more comprehensive than the Six-Cities or AHSMOG studies.

The CD's conclusion on p. 108 about agreement on "substantial evidence for positive associations" is incorrect. The VA study findings are negative and significant.

The VA study is not mentioned in the "salient points" or conclusions of the chapter.

On p. 111, the CD complains that the format used by the VA study to present results makes it difficult to compare with other studies. This is an overstatement: We divided the 24-years of VA follow-up into 3 periods and showed that the implied risks tend to decline over time and that the best predictors are the exposures during follow-up, not before. In contrast, the extended ACS study presents only the pooled risks from 16 years of follow-up, which are lower than the risks for the first 8 years. Thus, there is an obvious declining trend in the ACS risks as well, which the CD does not discuss.

As discussed in comments for the Alliance of Automobile Manufacturers, there are now 7 published cohort-mortality studies. It appears that each cohort is different, in terms of its subjects and their implied mortality risks. Each cohort deserves the same degree of unbiased scrutiny and discussion in the CD.

Infant Mortality

EPA has recently shown a major interest in children's health, which is apparent in the CD.

There are only 2 recent US papers on infant mortality and PM, Woodruff et al. (1997) and Lipfert et al. (2000). Both are cross-sectional cohort studies. The CD tries to further the case for PM impacts on infants with foreign studies, even though such studies were excluded from consideration for adult mortality.

Woodruff in effect attributes about 40% of normal birth-weight SIDS cases to PM₁₀, and suggests that PM_{2.5} or sulfates are probably the real culprit. We did essentially a replication study using a subset of the same data, with similar methods as a baseline, and then different methods, which produced different results. The CD takes our baseline result as 'support' for Woodruff and then ignores most of our contrary findings.

The basic issue here is the geographic gradient in infant mortality (higher in the west) that has existed for decades. This gradient resulted in our prediction that sulfates are beneficial (negative risks). For example, our Table 8 shows that eliminating sulfates completely would double the US SIDS risk!

If this finding is rejected, then the analysis of Woodruff must also be rejected. The bottom line is that there is no credible evidence for adverse PM effects on US infant mortality at current ambient levels. The relevant CD summary sections should be changed to remove any implications to the contrary, especially the section on life-shortening.

A Post-Teleconference Note

I would like to go on record as enthusiastically supporting the notion of a web-based tracking system for developing and vetting a CD on a continuing basis, as suggested today by some CASAC members or panelists. It should be clear to all concerned that after 8 years since the previous CD and now 5 external review drafts, EPA's "business as usual" approach to the continuing flood of relevant literature must change. Perhaps SAB or CASAC could organize a workshop to consider relevant ideas, say this summer.