UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D C 20460

November 5, 1986

OFFICE OF
THE ADMINISTRATOR

The Honorable Lee M. Thomas
Administrator
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, DC 20460

Dear Mr. Thomas:

The Science Advisory Board's Indoor Air Quality Research Review Panel prepared this report in response to the request to undertake a review of the Office of Research and Development's (ORD) plan to assess indoor air research needs. This broad based review focused on research plans, design of a limited field study, and ongoing research.

Although the Agency was not specifically charged with responsibility for indoor air quality under the Clean Air Act Amendments of 1977, it is the Federal agency whose mission clearly relates to this issue. This mission is supported by the recent passage of the Radon Gas and Indoor Air Quality Research Act of 1986, as well as language in the House of Representatives appropriations bills for fiscal years 1984 and 1985. Through its research activities in support of the regulatory work in the Office of Air and Radiation, the Agency has made substantial contributions to the knowledge of the factors determining indoor air quality, and of its effect on human health. Nevertheless, the Panel concluded that while the indoor air research being conducted was of high quality, the research taken as a whole did not constitute a "program" in indoor air quality.

Our major recommendations include: 1) development and adoption of a clear policy statement that indoor air quality is an important and essential component of the responsibility of the Agency, 2) assigning responsibility for the indoor air quality program to an individual of appropriate scientific stature with specific experience in this area, 3) the proposed limited field survey should not be carried out as presented since the resources that it would demand are not commensurate with the scientific information and insights which would be derived, 4) preparation of a relative risk assessment for the more important pollutants (including asbestos, biological contaminants, criteria air pollutants, and toxic chemicals) in order to develop a framework for desision making, and 5) eight general conclusions and recommendations concerning current research on indoor air quality.

In researching and preparing this report, the Panel was pleased with the cooperation and candor of Agency staff in conducting briefings and answering questions.

Thank you for the opportunity to present our evaluation of this program. We look forward to the Agency's response to our report.

Sincerely,

Jan A.J. Stolwijk, Chairman
Indoor Air Quality Research
Review Panel
Science Advisory Board

Norton Nelson, Chairman
Executive Committee
Science Advisory Board

cc: A. James Barnes
Vaun Newill
Craig Potter
Terry F. Yosie

SAB-EC-87-002

# REVIEW OF THE OFFICE OF RESEARCH AND DEVELOPMENT'S PLAN FOR ASSESSING INDOOR AIR RESEARCH NEEDS

A REPORT OF THE

INDOOR AIR QUALITY RESEARCH REVIEW PANEL

OF THE SCIENCE ADVISORY BOARD

October 24, 1986

U.S. Environmental Protection Agency
Science Advisory Board
Washington, D.C.

NOTICE

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U.S. Environmental Protection Agency
Science Advisory Board
Washington, D.C.

## Indoor Air Quality Research Review Panel

### Chairman

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### Panel Members

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### Executive Secretary

Mr. Robert Flaak, Environmental Scientist, Science Advisory Board, U.S. Environmental Protection Agency, Washington, D.C. 20460

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## 1. EXECUTIVE SUMMARY

As part of a continuing process for reviewing U.S. Environmental Protection Agency (EPA) research programs, the Science Advisory Board's (SAB) Indoor Air Quality Research Review Panel evaluated, on September 3-4, 1986, the Office of Research and Development's (ORD) indoor air research program. This broad based review focused on research plans, design of a limited field study and a review of ongoing projects (see Appendix A for further details on the Charge to the Panel). The Panel was also free to identify other program needs.

The Panel's major conclusions and recommendations are as follows:

- The EPA should develop and adopt a clear policy statement that indoor air quality is an important and essential component of its responsibility. This policy statement should state the broad objectives that are of the highest priority to EPA. Such an indoor air policy statement and program would serve the Office of Air and Radiation in providing the total exposure perspective to the mandated responsibility to assure clean air to the U.S. population. It would also more clearly define the policy and program goals toward which the research is directed.

- An effective Indoor Air Quality Program must be multi-disciplinary and thus needs to build on a framework which is common to all participants, with clearly recognizable goals. In view of the widespread interest in indoor air quality, and the wide range of clients, it is important that this framework for decision making be understandable and clearly relevant. The most effective common reference point would be a relative risk assessment for the more important pollutants (including asbestos, biological contaminants, criteria air pollutants, and toxic chemicals).

- The Panel unanimously concluded that the proposed limited field survey should not be carried out as presented. The resources it would demand are not commensurate with the scientific information and insight which would be derived. The relevance of the goals was not discussed and presented; the connection with other surveys of various types, completed or currently ongoing, was not established; and the design seemed to be based more on available methodologies than on a clearly perceived goal of the utility which the results would be likely to achieve. A more clearly defined set of objectives might be achievable at a much reduced level of effort. The statistical design, the measurement methodology, the quality assurance were all considered scientifically adequate. As an alternative to the proposed field study, a small field trial of nine residences in the Research Triangle Park (RTP) area of North Carolina, and of nine residences at a remote location, would present a cost effective opportunity to test the feasibility, of such a survey, as well as some of the variance to be expected.

- The Panel reviewed current indoor air quality projects, limiting itself to the relevance and balance of the projects. The Panel reached the following general conclusions and recommendations:

  - Existing work is biased heavily toward residential (single family) environments. The EPA should focus a reasonable amount of attention on occupants of commercial and public sector/public access buildings.

  - Responsibility for indoor air quality implies that areas that are not traditionally addressed in ambient air quality programs, such as radon, asbestos, and microbials, should be covered by coordinated research, intra-murally or extra-murally.

  - The EPA should more carefully articulate how it plans to integrate work carried out by other public agencies and private organizations into its own research program.

  - Building design, construction and operation are essential factors in indoor air quality. The EPA should develop some in-house competency in these areas which complements that present in other agencies.

  - The EPA should state what efforts are being undertaken to follow up on the approach based on a single unconfirmed study (by Mølhave) on the effects of mixtures of large numbers of volatile organic chemicals (VOC) in very low concentrations.

  - Monitoring research which does not have immediate policy relevant results should be regarded as less policy relevant than research aimed at source characterization and control, or research aimed at measuring health effects of exposures.

  The Panel has confidence in the investigators and the EPA staff, and concludes that in the presence of clearly stated Agency policies and a suitable administrative structure, they will produce an excellent program.

- Responsibility for the indoor air quality program should be assigned to an individual of strong, proven leadership who has appropriate scientific stature and specific experience in this area, who would devote full time attention to the program and to the implementation of a research needs assessment. The leadership of the program and the administrative structure should promote multi-disciplinary cooperation in the conception, initiation, and execution of projects, and to the dissemination of the information obtained.

## 2. INTRODUCTION

The U.S. Environmental Protection Agency has, for a number of years and on a limited basis, supported and carried out research on factors affecting indoor air quality. Much of the initial efforts addressed criteria air pollutants and how indoor concentrations related to outdoor concentrations. A number of events, observations and insights have served to make air quality in the indoor environment a more salient public health issue. Time budget studies conclude that a very large part of the twenty four hour day is spent in indoor environments. Other studies showed that there are many important sources of air pollutants inside buildings, and the rise in the price of energy in the decade of the 1970's changed the way buildings are constructed and operated. Studies in Western Europe, Canada and the U.S. demonstrated that for many pollutants and in many locations the major fraction of the total population exposure to air pollutants may occur indoors, and for many of these pollutants, such as environmental tobacco smoke, nitrogen dioxide, volatile organic chemicals and radon, the concentration indoors is often much higher than outdoors. These, and other developments, have led to a greatly increased public awareness of indoor air quality issues.

The EPA was not specifically charged with responsibility for indoor air quality under the Clean Air Act Amendments of 1977, but it is the Federal agency for which indoor air quality is closest to its central mission. Congress considers EPA as the lead agency for indoor air quality. Other Federal agencies which have programs and responsibilities in this area, such as the Department of Energy (DOE), the Consumer Product Safety Commission (CPSC), and the Department of Health and Human Services (DHHS), are represented in the interagency Committee on Indoor Air Quality (CIAQ), and they recognize the central position of EPA. It important that the ongoing coordination between these agencies continue.

Through its research activities in support of the regulatory work in the Office of Air and Radiation, EPA has made substantial contributions to our understanding of the factors determining indoor air quality, and of its effect on human health. More recently, research activities have included projects specifically supported by Congressional appropriations for indoor air quality research. The Agency has a number of capable and proven investigators who also have experience in managing and administering extramural research efforts. The CPSC, DOE and DHHS also conduct, support and administer research work of high quality on special aspects of indoor air quality.

## 3. NEED FOR AN EPA POLICY STATEMENT ON INDOOR AIR QUALITY

It is understandable that EPA has moved slowly toward defining its role in improving indoor air quality for the nation. At the time of the formation of the Agency, the relative importance of indoor air quality was not yet recognized. The realization of the importance of indoor air quality in protecting and advancing public health and welfare developed only gradually, and the Panel believes this realization is still growing.

Another reason for the slow development of an indoor air quality policy stems from the clear difference in strategy for the control of ambient (or outdoor) air pollutants compared to indoor pollutants. For ambient air, the most effective strategy is regulatory, while for indoor air quality a very different strategy may be required. One possible strategy for indoor air pollution control is to increase understanding through well-coordinated and designed research, followed by dissemination of this information to individual householders, architects, building managers and organizations that have an interest in or responsibility for the quality of indoor air in residences and public access buildings. Since neither individuals nor such organizations can effectively do all the research required to develop guidelines and control methodologies, this type of information and guidance would help to reduce risks to public health from indoor air quality by helping them make appropriate and well informed choices.

The EPA will continue to experience difficulty in establishing a viable and stable basis for assessing research needs and arriving at efficient decisions on research priorities, schedules and resource allocations, in the absence of a clear definition of the indoor air quality program and its objectives. To improve their effectiveness, EPA researchers must know what specific EPA policies and objectives their research is designed to address.

Although it is understandable that EPA policy on indoor air quality was not easily formulated nor quickly adopted in the past, the Panel recommends that EPA develop such a policy and state its high priority for the nation. Supporting this need is the continuing Congressional direction provided in House of Representatives appropriation bills for fiscal years 1984 and 1985, and the Radon and Indoor Air Quality Research Act of 1986 which is specific to EPA's role and responsibility for indoor air quality and radon research. Such a policy statement can provide integration to EPA's research and other program activities by ensuring that the research program and policy goals are jointly planned.

## 4. REVIEW OF ORD'S PLAN FOR DETERMINING FUTURE RESEARCH NEEDS ON INDOOR AIR POLLUTION

In assessing ORD's plan for future research needs the Panel considered the documents submitted, and presentations by EPA staff.

A scientifically effective indoor air quality research program must be a multidisciplinary one that builds on a framework which is common to all participants, with clearly recognizable goals. In view of the widespread interest in the area of indoor air quality, and the wide range of clients, it is important that this framework for decision making be understandable and clearly relevant. The most effective common reference point would be a relative risk assessment for the more important pollutants (including asbestos, biological contaminants, criteria air pollutants and toxic

chemicals). An example of the output of such an effort would be a table which in one column would list the factors in the indoor atmosphere that are considered important. The next column would list for each of the pollutants the 10, 50 and 90 percentile concentrations as encountered in indoor measurements, and the corresponding outdoor concentrations, with time-weighted exposures. The next column would contain the best estimate of the adverse health effects associated with the observed exposures for each pollutant. The final column would give, again for each pollutant, the total estimate of the incidence of these adverse health effects in the whole U.S. population associated with the exposures derived from previously described columns.

The EPA has not made such estimates in the past, but it should recognize that they will indicate a number of uncertainties and areas of inadequate knowledge. The construction of such a table will require coordinated input from all the disciplines now involved, and should be refined and updated as new information emerges. This table can also clarify which factors are least known or understood, and allow for comparisons of the relative impact on public health and the level of effort necessary. The Panel recommends that EPA staff directly undertake this assessment and not assign it to outside contractors, in order that internal competence improve and that the experience gained will be of maximum direct benefit to the program.

Over the years, such a table should also represent the clearest demonstration of progress that occurs in research and development and in the dissemination of this progress. The Panel knows that efforts have already begun to construct such a table which would also serve to present the best estimate of the current state of knowledge. It would also be useful to incorporate estimates of that fraction of the total population exposure which stems from the outdoor environment. Somewhat similar exercises have derived from the European Regional Office of the World Health Organization, EURO Reports and Studies 103 (1986): "Indoor Air Quality Research".

Finally, the construction of a table which constitutes the generally accepted state of knowledge and its formal dissemination as a basis for research policy decisions will assist in the more effective integration of interagency programs. It will also help to attract extramural investigator-initiated research proposals which match with Federal program needs. It will clarify to Congressional committees the status of current and future research activities.

## 5. REVIEW OF PRELIMINARY PROPOSAL FOR A FIELD SURVEY

The Agency presented the Panel with a preliminary design for a field study that is intended as a pilot for a much larger study in the future. The proposal recommends obtaining a large number of observations in residential environments through physical monitoring and through questionnaire responses from the occupants. The announced objective is to test the hypothesis that

the concentration of indoor air pollutants does not significantly vary in residential environments in different regions or seasons. The proposal specifically states that the study will

> "...address the magnitude of possible factors affecting the distribution of selected indoor pollutants in U.S. residences. This study will emphasize measurements for Volatile Organic Chemicals (VOC's), Semi-Volatile Organic Chemicals (SVOC's), and combustion products including particles (mass and chemical composition) and $NO_2$. The resulting data will be used by EPA in designing future Indoor Air Quality Surveys."

The overall design incorporated two phases. In Phase I, EPA would study nine homes near Research Triangle Park, N.C. with a similar cluster of nine homes studied in or near Gaithersburg, MD. The main purpose of Phase I is to test monitoring and survey instruments. In Phase II, EPA would select two cities. Current planning focuses on Baltimore, MD and Chattanooga, TN. In each of the two cities, EPA would monitor during each of four seasons, in four different ten home neighborhood clusters, for a total of 2 x 4 x 4 x 10 residences. The neighborhood clusters will be chosen randomly from the four quartiles of census derived housing values or from census derived income levels. Within a neighborhood cluster 10 homes would be chosen randomly. The measurement program presented concentrated on VOC's and SVOC's, particulates, $NO_2$, formaldehyde, water vapor, temperature, air exchange rate and nicotine by passive sampling. In addition, EPA plans to carry out screening interviews, baseline interviews and occupant diaries to capture building characteristics and occupant behavior.

The Panel did not possess sufficient information at the time of the review to conduct a detailed evaluation of the technical details of the design, although the Panel commends the Agency for its continuing efforts to use sound statistical practices in the design of surveys. It is evident that the instrumentation is close to, or at, the state of the art level and that EPA will require field validation for some of the methodology.

The major weakness of the proposal is not in the technical design, or in the ability to carry out the design, but in the scientific justification for planning and carrying out a study of this size and cost without demonstrating, or discussing the justification for, its need and how the results would be used. The Panel also found that the number and detail of secondary objectives were overstated and that these objectives could not be met. The Panel noted that EPA has obtained data of a somewhat similar nature in the Total Exposure Assessment Methodology (TEAM) studies. The methodology appears to derive in considerable part from the experience gained in TEAM studies. The TEAM results were not used in any observable way to anticipate the results in the proposed new survey or to assess the qualitative and quantitative variance which could be expected. An analysis and interpretation of the TEAM results along the lines of the planned survey was not evident and would be most instructive.

The Panel unanimously agrees that the field survey proposal should not be carried out as currently presented. The justification presented was not commensurate with the information and insight that EPA would obtain. The relevance of the goals was not discussed and presented; the connection with other surveys of various types, completed or currently ongoing was not established; and the design seemed to be based more on available methodologies than on a clearly perceived goal on the utility which the results would be likely to achieve. A more clearly defined set of objectives might be achievable at a much reduced level of effort.

The Panel concludes that a small field trial of nine residences in the Research Triangle Park area, and of nine residences at a remote location would present the opportunity to test the feasibility, as well as some of the variance expected. It also believes that such an effort would contribute to the building of confidence and competence, especially if EPA staff took an active part in the undertaking.

## 6. REVIEW OF ONGOING RESEARCH PROJECTS RELATED TO INDOOR AIR QUALITY

The Panel reviewed ongoing research projects in the areas of monitoring, source characterization and control, and health effects. The charge to the Panel did not include a detailed evaluation of all of the projects but, rather, to comment on the balance, coherence and objectives of the overall program.

In each research area the Panel found that projects are designed and executed with competence and dedication. The scientific and technical soundness, however, is not matched by coherence, clarity or the relative importance of the overall goals. The investigators could not be expected to produce spontaneous coordination, or to develop coordinated objectives without clear policy guidance.

The existing research program currently consists of a collection of projects with few linkages between them. In reviewing this ongoing program, the Panel reached the following conclusions:

- The balance of concern is still biased heavily toward residential (single family) environments. The EPA should focus a reasonable amount of attention on occupants of commercial and public sector/public access buildings. A large number of Americans spend about equal amounts of time in these two environments.

- Responsibility for indoor air quality implies that areas that are not traditionally addressed in ambient air quality programs, such as radon, asbestos, and microbials, should be covered by coordinated research, intra-murally or extra-murally.

- The EPA should more carefully articulate how it plans to integrate work carried out by other public agencies and private organizations into its own research program. Even studies done within EPA by another laboratory other than those located at RTP do not appear to be integrated into new plans. There appears to be a tendency to start de novo projects, rather than building on what is already known.

- Building design, construction and operation are essential factors in indoor air quality. Although these areas of expertise exist in several other Federal agencies, the EPA should develop some in-house competency in these areas which complements that present in other agencies. This is supported by the recent Radon Gas and Indoor Air Quality Research Act of 1986.

- The EPA should state what efforts are being undertaken to follow up on the approach based on a single unconfirmed study (by Mølhave) on the effects of mixtures of large numbers of volatile organic chemicals (VOC) in very low concentrations. The Agency should also state what efforts, if any, are being considered to replicate or otherwise confirm this work.

- Monitoring research which does not have immediate policy relevant results should be regarded as less policy relevant than research aimed at source characterization and control, or research aimed at measuring health effects of exposures. Both of the latter can produce results that are immediately usable, and the Panel finds that the flow of resources does not correspond to that relevance. Having clearly stated policies and objectives is likely to bring about changes in these patterns.

The Panel has confidence in the investigators and the EPA staff, and concludes that in the presence of clearly stated Agency policies and a suitable administrative structure, they will produce an excellent program.

## 7. PROGRAM MANAGEMENT

There is a need for a management structure which can both provide the leadership and be held accountable for the clear definition and implementation of research objectives, and a manager who can nurture, guide, and coordinate the clearly very capable human resources and material support dedicated to the indoor air quality program.

Responsibility for the indoor air quality program should be assigned to an individual of strong, proven leadership who has appropriate scientific stature and specific experience in this area, who would devote full time attention to the program and to the implementation of a continuing research needs assessment. The administrative structure, and the leadership of the program should promote multi-disciplinary cooperation in the conception, initiation, and execution of projects, through to the dissemination of the information obtained.

# APPENDIX A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 15 1986

OFFICE OF
RESEARCH AND DEVELOPMENT

MEMORANDUM

SUBJECT: SAB Review of ORD's Plan for Assessing Indoor Air Research Needs

FROM: Scott R. Baker
Special Assistant to the Assistant Administrator
for Research and Development (RD-672)

TO: Terry F. Yosie
Director
Science Advisory Board (A-101)

The Office of Research and Development is pleased to have the Science Advisory Board consider EPA's plan for assessing indoor air research needs. The plan is in a formative stage. While substantive details of the its content have not yet been identified, a review at this stage is timely because it allows us to obtain broad, conceptual, scientific advice early in the process, when flexibility and opportunities for accommodating constructive opinions are greatest. We would like to outline for the Panel our perception of the review's purpose, our needs from the Panel, the specific issues that are important for the Panel to address to help us proceed effectively, and the steps we are taking in planning the Agency's future indoor air research program.

## Purpose of the Review

ORD is seeking SAB opinion in three areas:

(1) Scientific advice on the approach that ORD proposes to take in carrying out its assessment of future research needs;

(2) Advice on ORD's preliminary design for an exploratory field study; and

(3) Review of ongoing projects that are considered to be influential in the design of the future research plan.

For the past three years, ORD has had a focused research program to address fundamental questions about the magnitude of the indoor air pollution problem. Appropriately, after this initial phase, ORD has now begun an assessment of the current state of knowledge to identify critical gaps about exposures to indoor pollutants, their potential health effects, sources, and possible mitigation measures in all types of buildings. On the basis of the assessment, ORD will refocus its research program to provide greater disciplinary balance and enhanced relevance to any anticipated Agency decision-making. ORD will simultaneously carry out a limited field study to obtain selected data that will more clearly illuminate major gaps in knowledge.

This direction for EPA's indoor air research program has the support of the interagency Committee on Indoor Air Quality, EPA program and policy offices, and Congressional staff. However, all parties agree that before ORD commits its resources fully to this approach, it should seek the advice of scientific experts in the field, including that of the SAB. At the same time, it will be useful for ORD to receive scientific advice from the SAB on the utility of research projects currently underway (or planned at EPA) that might be expected to contribute significantly to the foundation of ORD's future research plan.

Scope of the SAB Review

(1) Scientific advice on the plan for conducting a research needs assessment - ORD will present to the SAB Panel a framework describing how it intends to carry out its assessment and will specify the data bases that will be examined. We would like the SAB Panel to offer its advice on the proposed approach to assessing the gaps in scientific knowledge, including the adequacy, individually and as a whole, of the data bases that will be used in the assessment of research needs. In our desire to conduct a thorough assessment, we are particularly concerned about balance: whether or not we have identified for inclusion in the assessment all appropriate issues; and whether or not we have properly framed the issues to be considered. In this context, it is important that the SAB advise us on the appropriateness of (1) including the following issues in our assessment, individually and on the whole, (2) including any additional issues, and (3) our rationale for characterizing each issue as we have done, recognizing that certain elements were deliberately included or excluded. We are not asking the SAB to advise us on the position EPA should adopt on each issue; to do so at this time would preempt the analytic process that we expect will ensure a product of high scientific quality.

Issues for the Research Needs Assessment

- Selection of chemicals for consideration in the assessment
- Monitoring research
  - Balance between private residences and commercial (public access) buildings
  - Balance between indoor air exposure and total exposure
  - Balance between microenvironmental studies, personal monitoring, and ambient monitoring
  - Identification of needs for development of chemical class-specific monitoring methods.

- Health research
  - Balance of attention to products of combustion, side-stream cigarette smoke, volatile organic compounds (individually and in complex mixtures)
  - Appropriate health-related endpoints to consider in an indoor air research program, including cancer, respiratory effects neurotoxicological effects, and other unknown classes of effects
  - Appropriate exposure scenarios, including chambers, test houses, and field/epidemiology studies.
- Source characterization
  - Appropriate methods to enhance understanding of sources, including chambers and field-level test houses
  - How to determine the role of source characterization in conducting health risk assessments on indoor air pollutants
  - Alternative approaches for ranking sources for testing.
- Control technology
  - Determining cost-effective methods for ensuring good indoor air quality.
- Overall
  - Balance between hazard assessment, exposure assessment, source characterization, and risk mitigation strategies to ensure a proper interrelation between risk assessment and risk management
  - The markets to which the outputs of the future program should be oriented, including consumers (for public decision-making), states and municipalities, regulatory programs, and private-sector manufacturers.

The Office of Air and Radiation (OAR) has recently initiated a policy coordination and development process for indoor air within EPA. This process involves extensive participation by ORD and the policy and program offices within the Agency. As part of this process, OAR will soon undertake a problem characterization study on indoor air. This study is being designed to provide an overview of the problem and to formulate issues around which policy options can be clearly defined. OAR is now developing the central questions that will form the basis of this overview study, and will circulate them within the Agency for review. It is anticipated that these questions will be available to the SAB prior to its meeting for information purposes only. It is intended that the questions lend perspective to the SAB in its review of ORD's activities.

(2) Design of a limited, exploratory field study - There are at least two major uncertainties about indoor air pollutants that ORD believes could be resolved by a limited field study: whether there are regional differences among indoor air pollutant emissions from consumer products found in homes; and whether seasonal differences of product use and exposure exist. The hypothesis is that the distribution of consumer products does not vary sufficiently across the U.S. to cause regional and seasonal differences in indoor air concentrations. This hypothesis will be tested in the limited field study. In addition, this study will serve to test much of the monitoring methodology and technology that has been developed over the past several years. Before embarking on a detailed design for such a study, ORD is seeking SAB advice on a preliminary study designed to address these issues. Specifically, we would like to know the SAB's views on the likelihood of the proposed design providing an adequate test of the hypothesis.

(3) Review of ongoing and planned studies

- In expectation that the indoor air problem would receive increasing priority, ORD has been conducting research to improve methodologies. These projects have spanned the range from development of methods for source emission testing, to methods for monitoring and health assessment. We will present to the SAB a brief overview of the monitoring, health, and engineering components of the indoor air program and greater detail on certain studies. While they are part of an integrated and coherent indoor air research program, the individual studies taken alone represent important methodological investigations that have been conducted by individual EPA researchers and which will allow us to fill critical gaps in our understanding of indoor air pollution.

  ORD would like the SAB to comment on the relevance of these studies to the proposed plan for assessing research needs. In keeping with the concept of SAB reviews of Research in Progress, we would value advice on whether we are "doing the right research" in contrast to "doing the research right."

To assist you in preparing for the meeting, we have attached three documents that will be the basis for presentation and discussion:

(1) A status report of ORD's indoor air research program. Please consider the sections on source characterization, monitoring methods development, field studies, and health as background information for the discussion of ongoing studies;

(2) A document outlining the proposed approach to the research needs assessment; and

(3) A description of the preliminary design for a limited field survey.

As is customary, the Panel may choose to consider additional issues for discussion. We look forward to engaging in a productive dialogue with the Panel. We would be pleased to discuss our three requests with any Panel members prior to the meeting. Thank you for assisting us in this activity.

Attachments

cc: Gerald G. Akland (MD-56)
Donald J. Ehreth (RD-672)
Elissa Feldman (RD-672)
Robert A. Flaak (A-101F)
Judith A. Granam (MD-51)
David Maye (MD-56)
Courtney Riordan (RD-680)
Charles Rodes (MD-56)
William G. Tucker (MD-54)
Lance Wallace (RD-680)