

State of California
AIR RESOURCES BOARD

Resolution 04-1

January 22, 2004

Agenda Item No.: 04-1-3

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2546-233, entitled "Air Pollution and Cardiovascular Disease in the California Teachers Study Cohort," has been submitted by the Department of Health Services.

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2546-233 entitled "Air Pollution and Cardiovascular Disease in the California Teachers Study Cohort," submitted by the Department of Health Services, for a total amount not to exceed \$189,992.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2546-233 entitled "Air Pollution and Cardiovascular Disease in the California Teachers Study Cohort," submitted by the Department of Health Services, for a total amount not to exceed \$189,992.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$189,992.

I hereby certify that the above is a true and correct copy of Resolution 04-1, as adopted by the Air Resources Board.

Stacey Dorais, Clerk of the Board

ATTACHMENT A

“Air Pollution and Cardiovascular Disease in the California Teachers Study Cohort”

Background

The relationship between short-term (i.e., 24 hour) exposure to ambient air pollution and exacerbation of pre-existing cardiopulmonary illness and mortality in susceptible individuals has been well established. However, little is known about the health effects of long-term exposure of ambient air pollution, particularly on the development of cardiac or respiratory diseases and mortality; and the roles of specific sources, especially traffic-associated emissions, with respect to the pathogenesis of chronic illness. This study makes use of an existing dataset, the California Teachers' cohort, established by the Northern California Cancer Center and the California Department of Health Services, which includes 133,479 current and former female public school teachers and administrators recruited in 1995. The information gathered from this cohort will allow the investigators to study whether long-term exposure to PM (PM10 and PM2.5) air pollution or to any of several gaseous pollutants is associated with cardiovascular and cardiopulmonary disease incidence or mortality.

Objective

The overall objective of this study is to understand the role of air pollution, including particulate and gaseous pollutants, in the development of cardiovascular and cardiopulmonary disease and mortality from cardiovascular and cardiopulmonary disease. Specifically, the investigators propose three main objectives:

- 1) To examine whether long-term exposure to PM air pollution or to any of several gaseous pollutants is associated with cardiovascular, cardiopulmonary, and total mortality.
- 2) To examine whether long-term exposure to PM (principally PM10 and PM2.5) or to any of several gaseous pollutants is associated with the incidence of myocardial infarction or stroke.
- 3) To examine whether exposure to traffic emissions, measured by residential proximity to busy roads, is specifically related to cardiovascular disease incidence and/or mortality.

Methods

The investigator will calculate monthly averages of the ambient pollutants and determine the long-term exposure from the closest monitor to the teachers' residence. In addition, the investigators propose to use three data sources to generate three separate traffic measures as surrogates of exposure. These include a) vehicle density (which provides an estimate of potential exposure to evaporative and cold-start emissions because it is a measure of where vehicles are parked at night), b) road density (which is a measure of miles of road per square mile of land area around each study participant's address), and c) traffic density (which is a count of number of vehicles traveling on a particular road over a 24-hour period).

Analyses of data will be done using the Cox Proportional Hazards model which will allow the investigators to assess risk of each outcome associated with pollutants of interest after adjusting for a variety of individual-level risk factors.

Expected Results

The results would be the first to examine impacts of long-term traffic exposures on incidence and mortality from cardiovascular disease in the U.S., and would also be the first large cohort anywhere to examine the relationship of long-term air pollution exposure on the incidence of new cases of cardiovascular diseases. This study has the potential to gather more exposure information than the well-known American Cancer Society and Six-Cities studies and will provide new insight into the potential role of air pollution on the incidence of and mortality from cardiovascular and cardiopulmonary disease.

Significance to the Board

There are very few studies that have looked at long-term exposure of ambient air pollution, and how it may be linked to cardiac and respiratory disease is an issue of enormous public health and regulatory significance. These results would be important in the next reviews of the ambient standards for PM10, PM2.5, and gaseous pollutants in California.

Contractor:

The Department of Health Services

Contract Period:

24 months

Principal Investigator (PI):

Michael Lipsett, M.D.

Contract Amount:

\$189,992

Cofunding:

No co-funding, but the principal investigator and other DHS personnel are donating their time to this project.

Basis for Indirect Cost Rate:

The indirect cost rate is a negotiated rate with the Department of Health Services of zero percent. The rate of 19.6% for the subcontractor Impact Assessment, Inc. is relatively low for a private corporation and is a federally approved rate.

Past Experience with this Principal Investigator:

Michael Lipsett, M.D., is Chief of the Exposure Assessment Section, Environmental Health Investigations Branch, California Department of Health Services, Oakland, California. In addition, his experience in air pollution and epidemiology has been invaluable in the evaluation the California Ambient Air Quality Standards for particulate matter. He is an accomplished investigator who has published over 35 studies that are related to ambient air, indoor air pollution, and health effects.

Prior Research Division Funding to DHS:

Year	2002	2001	2000
Funding	\$0	\$0	\$0

BUDGET SUMMARY

Department of Health Services

“Air Pollution and Cardiovascular Disease in the California Teachers Study Cohort”

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	0
2.	Subcontractors	\$	189,992 ¹
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	0
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	0
7.	Mail and Phone	\$	0
8.	Supplies	\$	0
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>0</u>
	Total Direct Costs		<u>\$ 189,992</u>

INDIRECT COSTS

1.	Overhead	\$	0
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>
	Total Indirect Costs		<u>\$ 0</u>

TOTAL PROJECT COSTS

\$189,992

¹ Subcontractors:

Impact Assessment, Inc. for a total cost of \$189,992.

Attachment 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Impact Assessment, Inc.

Description of subcontractor's responsibility: IAI will provide the services of specialized research staff and maintain responsibility for all aspects of contract management including financial management, monitoring and reporting, personnel administration, secondary subcontract and consultant purchasing as well as lease agreement.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	122,645	
2.	Subcontractors	\$	10,000 ¹	
3.	Equipment	\$	0	
4.	Travel and Subsistence	\$	2,028	
5.	Electronic Data Processing	\$	3,000	
6.	Reproduction/Publication	\$	3,876	
7.	Mail and Phone	\$	1,338	
8.	Supplies	\$	0	
9.	Analyses	\$	0	
10.	Miscellaneous	\$	<u>16,461²</u>	
	Total Direct Costs			<u>\$159,348</u>

INDIRECT COSTS

1.	Overhead	\$	0	
2.	General and Administrative Expenses	\$	0	
3.	Other Indirect Costs	\$	30,644 ³	
4.	Fee or Profit	\$	<u>0</u>	
	Total Indirect Costs			<u>\$30,644</u>

TOTAL PROJECT COSTS \$189,992

¹A subcontract with Dr. Richard Burnett, Ph.D. for \$10,000 will be used to provide expertise on the statistical analyses, particularly on spatial autocorrelation.

² Facilities Rent \$10,829
General Expenses 4,476
Consolidated Data Center 1,156
\$16,461

³Other costs that are normally considered indirect have been placed under Miscellaneous. Staff believe that those costs combined with these indirect costs still render a reasonable indirect cost rate.

State of California
AIR RESOURCES BOARD

Resolution 04-2

January 22, 2004

Agenda Item No.: 04-1-3

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2545-233, entitled "Determination of Reactive Oxygen Species Activity in PM and Enhanced Exposure Assessment for the NIH, NIEHS Study Entitled: Ultrafine Particulate Matter and Cardiorespiratory Health," has been submitted by the University of California, Irvine;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2545-233, entitled "Determination of Reactive Oxygen Species Activity in PM and Enhanced Exposure Assessment for the NIH, NIEHS Study Entitled: Ultrafine Particulate Matter and Cardiorespiratory Health," submitted by the University of California, Irvine, for a total amount not to exceed \$175,000.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2545-233, entitled "Determination of Reactive Oxygen Species Activity in PM and Enhanced Exposure Assessment for the NIH, NIEHS Study Entitled: Ultrafine Particulate Matter and Cardiorespiratory Health," submitted by the University of California, Irvine, for a total amount not to exceed \$175,000.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$175,000.

I hereby certify that the above is a true and correct copy of Resolution 04-2, as adopted by the Air Resources Board.

Stacey Dorais, Clerk of the Board

ATTACHMENT A

“Determination of Reactive Oxygen Species Activity in PM and Enhanced Exposure Assessment for the NIH, NIEHS Study Entitled: Ultrafine Particulate Matter and Cardiorespiratory Health”

Background

The National Institute of Environmental Health Sciences (NIEHS) is funding a major health study that includes collection of health outcome data from elderly people who reside at sheltered living facilities in southern California. The study, as approved by NIEHS, will use data from existing routine air monitoring stations, personal and indoor monitoring, as well as ultrafine PM counts and activity records as exposure predictors. Participants will be followed in 4 communities each studied during periods of both high and low photochemical activity. A total of 72 subjects will be followed in small groups during repeated 5-day periods of study. Each subject will wear monitors to record heart electrical activity and blood pressure, and will carry electronic diaries to record locations and activities. The investigators crafted their proposal to maximize the study sample size and to assure that critical effects measures were made while not exceeding NIEHS funding caps.

Methods

The current proposal would provide funds and monitoring resources to expand the nature of air pollution data available for the NIEHS-supported health study, as well as to add collection and evaluation of the chemical and biological characteristics of PM samples. A mobile monitoring trailer would be assembled and instrumented by ARB. It would report ultrafine particle counts, NO_x, CO, Ozone, SO₂, as well as continuous PM mass (PM₁₀ and PM_{2.5}), carbon, nitrate, and sulfate. Indoor air monitoring efforts would also be enhanced by the operation of gaseous and carbon monitors. Mechanistic studies related to reactive oxygen species (ROS) are included. The ROS assays may reflect cellular level toxicity of particles that may explain how PM can harm people. The investigators will perform analyses of four quinone compounds that have previously been shown to play a role in redox reactions.

Objective

The overarching objective of the parent NIEHS funded study is to determine the nature of particulate-phase air pollution impacts on various parameters related to the health status of people who have existing cardiorespiratory disease. The specific objectives of this proposal are:

- To augment, extend, and improve existing air pollution monitoring activities. This will provide improved data for exposure assessments for particulate and gaseous air pollutants of health concern. The requested \$175,000 will be applied to fund efforts within this objective; and
- To evaluate the nature of particulate matter interactions with specific markers of possible chemical and biochemical activities that may be especially harmful. These markers are known as reactive oxygen species (ROS).

Expected Results

The results of this study are expected to define how common air pollutants, especially particle phase pollutants, are related to observed health impacts in people who may be at special risk because of existing cardiovascular disease. The results of joint ARB/ South Coast Air Quality Monitoring District-funded extensions of this work will enhance the likelihood of finding pollutant associations and will expand investigations to possibly explain the biological mechanisms by which effects may occur.

Significance to the Board

This study would address important questions of which chemical or size fractions of PM are most harmful, and what biological mechanisms underlie harmful effects. The funds requested would be heavily leveraged against a federally sponsored project. The findings of this study would have direct application to our Vulnerable Populations Research Program, to evaluations of air quality standards for PM, and increase our level of understanding regarding important air pollution exposures experienced by the elderly, a group of special concern for adverse impacts from ambient PM. The nature of the overall study, with the proposed additional monitoring, may provide findings regarding the short-term health consequences of PM exposure.

Contractor:

University of California, Irvine

Contract Period:

36 Months

Principal Investigator (PI):

Ralph Delfino, M.D., Ph.D.

Contract Amount:

\$175,000 (cost sharing is anticipated between ARB and the South Coast Air Quality Management District to fund full amount).

Cofunding:

This project is heavily cofunded. The base project is funded by the National Institute of Environmental Health Sciences at an amount of \$3.3 million. The current proposal requests approximately \$175,000. At this time, we plan to work with the South Coast Air Quality Management District to provide the required total funding and monitoring resources.

Basis for Indirect Cost Rate:

Indirect cost from the University of California, both for the prime contractor (UC Irvine) and a subcontractor (UC Los Angeles) are calculated at a rate of 10 percent while that for the subcontractor the University of Southern California are calculated at a rate of 30% (down from typical rates of over 55%).

Past Experience with this Principal Investigator:

The investigator has a well-earned reputation at the national level for innovative field epidemiological studies. He recently successfully completed a study funded by the ARB and the South Coast Air Quality Management District that evaluated the nature of childhood asthma and community exposures to toxic and criteria air pollutants.

Prior Research Division Funding to UCI:

Year	2002	2001	2000
Funding	\$140,590	\$34,800	\$200,000

BUDGET SUMMARY

University of California, Irvine

“Determination of Reactive Oxygen Species Activity in PM and Enhanced Exposure Assessment For the NIH, NIEHS Study Entitled: Ultrafine Particulate Matter and Cardiorespiratory Health”

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 91,707	
2.	Subcontractors	\$ 0	
3.	Equipment	\$ 71,200 ¹	
4.	Travel and Subsistence	\$ 0	
5.	Electronic Data Processing	\$ 0	
6.	Reproduction/Publication	\$ 0	
7.	Mail and Phone	\$ 0	
8.	Supplies	\$ 2,657	
9.	Analyses	\$ 0	
10.	Miscellaneous	\$ 0	
	Total Direct Costs		<u>\$ 165,564</u>

INDIRECT COSTS

1.	Overhead	\$ 9,436	
2.	General and Administrative Expenses	\$ 0	
3.	Other Indirect Costs	\$ 0	
4.	Fee or Profit	\$ 0	
	Total Indirect Costs		<u>\$ 9,436</u>

TOTAL PROJECT COSTS \$ 175,000

¹ Equipment- 2 continuous EC-OC analyzers (including shipping and training).

State of California
AIR RESOURCES BOARD

Resolution 04-3

January 22, 2004

Agenda Item No.: 04-1-3

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2547-233 entitled "Survey of Ventilation Practices and Housing Characteristics in New California Homes," has been submitted by the University of California, Berkeley;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2547-233 entitled "Survey of Ventilation Practices and Housing Characteristics in New California Homes," submitted by the University of California, Berkeley, for a total amount not to exceed \$445,864.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2547-233 entitled "Survey of Ventilation Practices and Housing Characteristics in New California Homes," submitted by the University of California, Berkeley, for a total amount not to exceed \$445,864.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$445,864.

I hereby certify that the above is a true and correct copy of Resolution 04-3, as adopted by the Air Resources Board.

Stacey Dorais, Clerk of the Board

ATTACHMENT A

“Survey of Ventilation Practices and Housing Characteristics in New California Homes”

Background

The California Energy Commission (Commission) sets energy efficiency standards for new California homes that reduce building air leakage in order to conserve energy. These standards assume that acceptable indoor air quality is maintained by certain levels of air exchange between indoor and outdoor air due to occupant window-opening habits and other activities. Concerns have been raised that occupants do not use windows, doors, exhaust fans, and other mechanical ventilation devices sufficiently to remove formaldehyde and other indoor contaminants, such as emissions from heating and cooking. To determine whether revisions are needed in the next update of the state building energy standards to address these concerns, the Commission needs information on ventilation practices in new California homes. In addition, ARB needs information about materials and activities that emit formaldehyde and other Toxic Air Contaminants in new homes. This information is needed to assess Californians' exposures to toxic air contaminants as required by Health and Safety Code Section 39660.5, and to help design a field study of indoor air quality in new homes.

There is no information currently available on ventilation practices in new California homes and the reasons for these practices. In addition, there is little information available regarding the mix of building materials, appliances, and other potential pollutant sources currently used in constructing new California homes. The Commission is funding this study, and will fund a follow-on field study of indoor air quality and ventilation in new homes.

Objectives

The goals of this study are to obtain information needed to guide the development of future building standards that protect indoor air quality in California homes, and to obtain information useful for updating and improving exposure and risk assessments for indoor and outdoor air pollutants in California. The objectives of this study are to:

- 1) Determine the extent to which occupants use windows, doors, and mechanical ventilation devices in new single-family homes in California.
- 2) Determine the occupants' perceptions of and satisfaction with indoor air quality in their homes.
- 3) Determine the relationships among ventilation practices, indoor air quality indicators, house characteristics, and household factors.
- 4) Identify barriers to occupant use of natural and mechanical ventilation to achieve adequate air exchange in their homes.

Methods

Investigators will conduct a mail survey of about 1,000 owner-occupants of new California homes in three different climate zones over at least two seasons. The investigators will first develop and pre-test a questionnaire on building characteristics

and appliances, ventilation practices, occupant satisfaction with indoor air quality and environmental conditions, indoor pollutant sources, occupant activities, occupant health status, and household socioeconomic factors. The questionnaire will then be mailed to a random selection of owner-residents of new homes. A sub-group of homes with “whole-house” mechanical ventilation systems that are designed to increase outdoor air exchange rates will also be targeted. The investigators will conduct basic statistical analyses of the survey responses, and analyze the relationships among ventilation practices, perceptions and indicators of indoor air quality, house characteristics, and household socioeconomic factors.

Expected Results

The study will produce high-quality, representative data on factors that determine ventilation sufficiency and indoor air quality in new homes, and the relationships among those factors. The study will also provide information needed for designing and conducting a companion field study, as well as potential participants for the field study.

Significance to the Board

This proposed study would be the first major study of ventilation practices and other factors affecting indoor air quality in new California homes. The results would help ARB to identify the types and use of pollutant sources in new homes, such as new carpets, paint, cabinetry, and heating and cooking appliances. ARB would use the study results to: 1) assess Californians’ exposures to toxic air contaminants and guide possible future regulations; 2) obtain a sample and refine the study design for a field study of indoor air quality in new homes, and 3) develop recommendations to the public for achieving good indoor air quality in their homes. In addition, ARB and the Commission will use the results to determine the need for changes to the Commission’s building design and construction standards for ventilation of new homes in order to provide acceptable indoor air quality.

Contractor:

University of California, Berkeley

Contract Period:

24 months

Principal Investigator (PI):

Dr. Thomas Piazza

Contract Amount:

\$445,864

Cofunding:

The California Energy Commission is providing contract funding from the Public Interest Energy Research program, through an interagency agreement with ARB.

Basis for Indirect Cost Rate:

The State and UC System have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:

The Survey Research Center successfully completed two landmark surveys of human activity patterns that were conducted for ARB in the late 1980's. The Principal Investigator was a key member of the research teams for those studies and performed well.

Prior Research Division Funding to UCB:

Year	2002	2001	2000
Funding	\$2,302,154	\$1,091,907	\$16,895

BUDGET SUMMARY

Survey Research Center, University of California, Berkeley

“Survey of Ventilation Practices and Housing Characteristics in New California Homes”

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	166,984
2.	Subcontractors	\$	161,000
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	1,148
5.	Electronic Data Processing	\$	5,363
6.	Reproduction/Publication	\$	19,617
7.	Mail and Phone	\$	18,719
8.	Supplies	\$	822
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>46,314¹</u>

Total Direct Costs \$419,967

INDIRECT COSTS

1.	Overhead	\$	25,897
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>

Total Indirect Costs \$ 25,897

TOTAL PROJECT COSTS

\$445,864

¹ Miscellaneous costs include participant incentives, which have been found to be effective in increasing response rates in hard-to-reach population groups: cash incentives for focus group participants (\$600), a small gift such as post-it notes (\$5,715), and cash incentives for returned questionnaires (\$40,000). Depending on the feedback from focus groups, this questionnaire incentive may be reduced.

Attachment 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Lawrence Berkeley National Laboratory

Literature Review, Questionnaire Development, Data Analysis, Report Preparation, and Seminar Delivery

DIRECT COSTS AND BENEFITS

1. Labor and Employee Fringe Benefits	\$ 76,929
2. Subcontractors	\$ 0
3. Equipment	\$ 0
4. Travel and Subsistence	\$ 2,325
5. Electronic Data Processing	\$ 0
6. Reproduction/Publication	\$ 1,000
7. Mail and Phone	\$ 500
8. Supplies	\$ 1,050
9. Analyses	\$ 0
10. Miscellaneous	<u>\$ 28,638</u>

Total Direct Costs \$ 110,442

INDIRECT COSTS

1. Overhead	\$ 49,249
2. General and Administrative Expenses	\$ 0
3. Other Indirect Costs	\$ 1,309
4. Fee or Profit	<u>\$ 0</u>

Total Indirect Costs \$ 50,558

TOTAL PROJECT COSTS **\$161,000**

State of California
AIR RESOURCES BOARD

Resolution 04-4

January 22, 2004

Agenda Item No.: 04-1-3

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2544-233, entitled "Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds," has been submitted by the University of California, Berkeley;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2544-233 entitled "Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds," submitted by the University of California, Berkeley, for a total amount not to exceed \$269,330.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2544-233 entitled "Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds," submitted by the University of California, Berkeley, for a total amount not to exceed \$269,330.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$269,330.

I hereby certify that the above is a true and correct copy of Resolution 04-4, as adopted by the Air Resources Board.

Stacey Dorais, Clerk of the Board

ATTACHMENT A

“Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds ”

Background

Regulatory efforts to achieve fine particulate matter (PM_{2.5}) standards require improvements in our knowledge of the factors controlling the concentration, size and chemical composition of PM_{2.5}. While many advances have been made in measuring and modeling the inorganic ionic species that are found in PM_{2.5}, much less is known about the organic fraction. Yet organic matter is a major constituent of airborne particles, comprising 20-40% of the PM_{2.5} mass in many regions. Quantitative knowledge of the composition of PM_{2.5} organic matter is key to tracing its sources and understanding its formation and transformation processes. Traditional methods for organic compound identification and quantification involve collection by filtration, with subsequent extraction and analysis by liquid or gas chromatography. However, organic analysis of extracts from filters requires large samples, typically milligrams of collected organic material. The cost is high, and generally the time resolution is poor. This research proposal will address the critical need for on-line, time-resolved, quantitative measurement of atmospheric PM_{2.5} organics at the molecular level.

Objective

The objectives of this research study are to demonstrate the capability of a new technique for hourly measurement of the organic composition of ambient PM_{2.5} aerosols, to deploy the instrument for one month in the summer and one in the winter at a site in California, and to analyze the combined data sets to resolve organic aerosol source contributions based on factor analysis.

Methods

This research study will be conducted in two phases. In Phase I, the investigators would test the performance of their on-line aerosol GC/MS (gas chromatography followed by mass spectrometry) instrument in a field campaign. The instrument development and field study are completely funded by the U.S. Department of Energy (DOE). In Phase I, the investigators will prepare a written report for the ARB providing evidence that the new instrumentation is ready for field measurements in California. A small amount of ARB funding (less than \$10,000) will be used for Phase I to prepare the written report. Upon ARB's approval for continuation of the study, in Phase II, the investigators will deploy the instrument for measurements during one winter and one summer field campaign in order to investigate seasonal differences in organic aerosol sources and potential new source tracers. The field component of this research study includes 22-23 hourly samples per day, collected over a period of four weeks at during each deployment, which should result in approximately 600 samples per deployment. With quantitative data, at minimum, for 20 organic compounds per sample, this would provide 12,000 concentration values that can be used for the determination of organic particulate sources. This data density is much higher than ever achieved in past studies, and accordingly will provide a more robust data set for source apportionment data analysis.

Expected Results

The results of all parts of the project will be documented as a technical report submitted to ARB and as technical papers submitted to peer-reviewed journals. The investigator will provide to the ARB electronic copy of all the data collected during this research contract. The investigator will also present the results of the project to ARB staff at two 1-hour long technical seminars, one in Sacramento and the second in El Monte.

Significance to the Board

This research proposal will address the critical need for on-line, time-resolved, quantitative measurement of atmospheric PM_{2.5} organics at the molecular level. The sampling approach provides time-resolution not possible through filter sampling, while avoiding many of the well-documented artifacts associated with filter collection and sample storage and transport. This research will provide useful new data of immediate value for air quality attainment strategies for the Central Valley and the development of the State Implementation Plan.

Contractor:

University of California, Berkeley

Contract Period:

24 Months

Principal Investigator (PI):

Professor Allen Goldstein

Contract Amount:

\$269,330

Cofunding:

No co-funding but this project will be highly leveraged by approximately \$500,000 support from Department of Energy in Phase I.

Basis for Indirect Cost Rate:

The State and UC System have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:

This Principal Investigator has performed very successfully on past contracts. Professor Allen Goldstein has experience in quantifying organic compounds and Dr. Susanne Hering has extensive experience in particle measurement and developing and refining PM sampling techniques. Both investigators have extensive experience in building automated methods for continuous, unattended operation in the field and their research studies are well-published.

Prior Research Division Funding to UCB:

Year	2002	2001	2000
Funding	\$2,302,154	\$1,091,907	\$16,895

BUDGET SUMMARY

University of California, Berkeley

“Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds”

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$133,532
2.	Subcontractors	\$ 90,000
3.	Equipment	\$ 0
4.	Travel and Subsistence	\$ 10,000
5.	Electronic Data Processing	\$ 0
6.	Reproduction/Publication	\$ 1,500
7.	Mail and Phone	\$ 500
8.	Supplies	\$ 13,000
9.	Analyses	\$ 0
10.	Miscellaneous	<u>\$ 3,500</u>

Total Direct Costs \$252,032

INDIRECT COSTS

1.	Overhead	\$ 17,298
2.	General and Administrative Expenses	\$ 0
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	<u>\$ 0</u>

Total Indirect Costs \$17,298

TOTAL PROJECT COSTS **\$269,330**

Attachment 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Dr. Susanne Hering, Aerosol Dynamics Inc.

Description of subcontractor's responsibility: Subcontractor will work closely with UCB on the 2004 summer field study (Phase I), the two field deployments of the aerosol GC/MS systems during Phase II, and the subsequent source attribution efforts.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$80,315 ¹	
2.	Subcontractors	\$ 0	
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 6,707 ²	
5.	Electronic Data Processing	\$ 0	
6.	Reproduction/Publication	\$ 0	
7.	Mail and Phone	\$ 0	
8.	Supplies	\$ 2,978	
9.	Analyses	\$ 0	
10.	Miscellaneous	<u>\$ 0</u>	
	Total Direct Costs		<u>\$90,000</u>

INDIRECT COSTS

1.	Overhead	\$ 0	
2.	General and Administrative Expenses	\$ 0	
3.	Other Indirect Costs	\$ 0	
4.	Fee or Profit	<u>\$ 0</u>	

Total Indirect Costs

TOTAL PROJECT COSTS \$90,000

¹ Salary funds are requested for Dr. Susanne Hering to work 80 hours per year, Dr. Nathan Kreiberg to work 160 hours per year, and a research scientist to work 180 hours per year on this project for two years.

² Travel and subsistence are requested for two field campaigns of one-month duration each.