

State of California
AIR RESOURCES BOARD

Resolution 01-53

November 15, 2001

Agenda Item No.: 01-9-4

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 2502-222, entitled "Development and Application of Ambient Aerosol Concentrators to Conduct Health Effects Studies in the Los Angeles Basin," has been submitted by the University of California, Los Angeles;

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 2502-222 entitled "Development and Application of Ambient Aerosol Concentrators to Conduct Health Effects Studies in the Los Angeles Basin," submitted by the University of California, Los Angeles, for a total amount not to exceed \$1,200,000.

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 2502-222 entitled "Development and Application of Ambient Aerosol Concentrators to Conduct Health Effects Studies in the Los Angeles Basin," submitted by the University of California, Los Angeles, for a total amount not to exceed \$1,200,000.

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 \$1,200,000.

I hereby certify that the above is a true and correct copy of Resolution 01-53, as adopted by the Air Resources Board.

Marie Kavan, Clerk of the Board

ATTACHMENT A

“Development and Application of Ambient Aerosol Concentrators to Conduct Health Effects Studies in the Los Angeles Basin”

Background

Exposure to ambient particulate matter (PM) contributes to mortality and morbidity around the world. The harmful health effects from ambient PM exposures include exacerbation of asthma and respiratory illness, decreased lung function, and premature deaths. Up to 17,000 premature deaths per year in California can be linked to air pollution exposure. Despite substantial evidence of the harmful health effects from PM exposure, little is known of the mechanisms involved in PM toxicity, or the differences in the toxicity of the different size fractions of PM.

Previous investigations of PM toxicity have primarily emphasized the use of synthetic systems comprised of two or more components of ambient PM. These systems have the advantage of precise characterization, but they lack the complexity and variability seen in ambient PM. The new concentrator technology makes it possible to selectively concentrate different size fractions of ambient PM to be used in exposure studies. The mobile nature of the concentrator facilities allows investigation of site and seasonal variability as well.

Objective

This proposal is for years 3-5 of a five-year program and the overall objective of this five-year program is to develop a mobile inhalation exposure facility to concentrate coarse, fine, and ultrafine ambient particles in the Los Angeles Basin. The inhalation facility will be used to investigate the cardiopulmonary effects of size-specific ambient PM in human volunteers, sensitive animals (mice and rats) and cellular assays. During the first two years of this program, the investigators designed and characterized the performance of the fine, ultrafine, and coarse concentrators to be used in animal inhalation studies. In addition, animal exposures and cell culture studies were initiated to investigate the toxicity of particles at different locations in the Los Angeles Basin. The specific aims of years 3-5 include: the development of an ultrafine concentrator for human exposures, diesel and gasoline freeway emission studies in an allergic animal model, study of source and receptor site emissions in sensitive animal models, and collection of particles for cell toxicity studies.

Methods

Animal models, cell culture systems, and human volunteers will be exposed to coarse, fine, and ultrafine particles in transportable facilities. These studies will be used to determine cardiac and respiratory effects from particle exposure and will investigate size, site, and seasonal differences in ambient PM. Animal models (ovalbumin-sensitized Balb/c mice and Brown Norway rats) will be used to study asthma-like responses. These models are well characterized and exhibit several hallmarks of allergic air way disease including increased IgE, nonspecific airway hyperresponsiveness and eosinophil influx. Physiological, chemical, and structural endpoints will be studied to assess changes in cardiopulmonary function. Cellular toxicity studies will be conducted by exposing human cell cultures to coarse, fine, and

ultrafine ambient particles. Exposures will examine seasonal and site-specific changes in particle toxicity. Although the human exposure studies will be funded through sources other than ARB, the human subject approval was included as an appendix in this proposal.

Expected Results

This five-year program will result in the development of a mobile inhalation exposure facility to concentrate coarse, fine, and ultrafine ambient particles in the Los Angeles Basin. The inhalation facility will be used to study the cardiac and respiratory effects of ambient particle exposures in animal models, cell systems, and human volunteers. These investigations will provide data on the relative effects of different size fractions and compositions of PM and their contribution to the toxicity from PM exposure.

Significance to the Board

These investigations will result in important new information on the effect of particle exposure on asthma and allergy. The effects of season and site-specific ambient particles on sensitive subpopulations will also be studied. One of the many questions in the regulation of particle pollution has been the relative toxicity of different size fractions and different components of PM, as well as their effects on sensitive subpopulations. The information resulting from these studies is vital to developing future ambient air quality standards and control programs for different size fractions of PM.

Contractor:

University of California, Los Angeles

Contract Period:

36 Months

Principal Investigator (PI):

John R. Froines, Ph.D.

Contract Amount:

\$1,200,000

Cofunding:

The ARB's portion of this concentrator program is considerably strengthened by interactions and linkages with other Federal and State programs. Sites from the Children's Health Study will be used to perform both animal and cell studies using coarse, fine and ultrafine particle exposure. The complete characterization of the PM exposures in this program will be performed using a mobile Particle Instrument Unit, in coordination with the U.S. Environmental Protection Agency (USEPA)-funded Southern California Particle Center and Supersite program. In addition, the US EPA will fund all the human exposure studies, the cell toxicity studies, and the primary funding for the Brown Norway rat source/ receptor studies. The overall effort is a multicampus study involving experts in their fields from the University of California at Los Angeles (UCLA), the University of California at Irvine, the University of California at Davis, the University of Southern California, and Michigan State University. In addition, the cell systems studies involve collaboration with Dr. Andre Nel (UCLA) and Dr. Robert Devlin (USEPA). Dr. Henry Gong (Rancho Los Amigos) will direct the human exposure studies, which are funded by USEPA and the Health Effects Institute.

Basis for Indirect Cost Rate:

The indirect cost rate of 10 percent is a negotiated rate agreed to by the State and University of California campuses.

Past Experience with this Principal Investigator:

Dr. John Froines is a senior toxicologist and exposure assessment scientist who currently serves as the Principal Investigator for the USEPA-funded Southern California Particle Center and Supersite. Dr. Froines is also the Director of the UCLA Center for Occupational and Environmental Health. Dr. Froines is the Chair of the California Air Resources Board’s Scientific Review Panel which is the key body evaluating ARB proposed designation of Toxic Air Contaminants (TACs). Dr. Froines has demonstrated that he has the expertise and ability to oversee the administration, management, and scientific content of the project.

Prior Research Division Funding to the University of California, Los Angeles:

Year	2001	2000	1999
Funding	\$0	\$938,693	\$0

BUDGET SUMMARY

University of California, Los Angeles

Development and Application of Ambient Aerosol Concentrators to Conduct Health Effects Studies in the Los Angeles Basin

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$179,237 ¹
2.	Subcontractors	\$976,909 ²
3.	Equipment	\$ 0
4.	Travel and Subsistence	\$ 10,500
5.	Electronic Data Processing	\$ 0
6.	Reproduction/Publication	\$ 1,800
7.	Mail and Phone	\$ 3,600
8.	Supplies	\$ 5,400
9.	Analyses	\$ 0
10.	Miscellaneous	<u>\$ 0</u>
	Total Direct Costs	\$1,177,446

INDIRECT COSTS

1.	Overhead	\$22,554
2.	General and Administrative Expenses	\$ 0
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	<u>\$ 0</u>
	Total Indirect Costs	<u>\$22,554</u>

TOTAL PROJECT COSTS **\$1,200,000**

¹ \$46,216 for the PI, \$51,875 for staff, and \$81,146 for students (postdoctoral, graduate, and undergraduate)

² There are two subcontractors included in this project:
The University of Southern California will construct, install, and test the Fine plus Ultrafine Particle Concentrator. In addition, USC will collect particles for animal and cell studies and characterization of the atmospheres. Also, "proof-of-concept" studies will be done to evaluate the physical and chemical characteristics of concentrated aerosols and to demonstrate their relevance to ambient air exposures. The total budget for USC is \$384,264.

The University of California, Irvine will conduct animal studies in preparation for field operations at the Children's Health Study sites and for the freeway study. In addition, studies will be performed on the effects of freeway emission on the increase the severity of asthma and inflammatory responses in a sensitive animal model at two freeways, each with well-documented heavy diesel and gasoline traffic, respectively. An additional study will examine the effect of source and receptor site emissions in animal models. The total budget for UCI is \$592,645.

Attachment 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: University of Southern California

A subcontract with USC is an integral part of this proposal. The Principal Investigator for the USC subcontract is Dr. Constantinos Sioutas, an Associate Professor in the Department of Civil and Environmental Engineering. This subcontract is sought for a non-UC campus on a noncompetitive basis since Dr. Sioutas is the world leader in this technology and the only investigator in the Western United States with direct experience in design, construction and operation of an exposure Concentrator Facility. Any alternative would be more expensive due to the substantial base of theoretical and practical experience that is necessary for this project. Dr. Sioutas will direct activities which will include the construction, installation, and testing of a Fine plus Ultrafine Particle Concentrator. In addition, this subcontract will include collection of particles for animal and cell studies and characterization of the atmospheres. Also, "proof-of-concept" studies will be done to evaluate the physical and chemical characteristics of concentrated aerosols and to demonstrate their relevance to ambient air exposures.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$272,588 ¹
2.	Subcontractors	\$ 0
3.	Equipment	\$ 18,200 ²
4.	Travel and Subsistence	\$ 0
5.	Electronic Data Processing	\$ 0
6.	Reproduction/Publication	\$ 0
7.	Mail and Phone	\$ 0
8.	Supplies	\$ 9,000 ³
9.	Analyses	\$ 0
10.	Miscellaneous	<u>\$ 0</u>
	Total Direct Costs	\$299,788

INDIRECT COSTS

1.	Overhead	\$84,476
2.	General and Administrative Expenses	\$ 0
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	<u>\$ 0</u>
	Total Indirect Costs	<u>\$84,476</u>

TOTAL PROJECT COSTS **\$384,264**

1. Total requested by PI, \$16,560 for year 3, \$26,734 for year 4, and \$17,024 for year 5. Total requested for a postdoctoral researcher for year 3-5 \$145,409.
2. A total of \$18,200 is requested for Equipment for years 3-5 of which \$6,000 will be spent to construct an impactor, \$5,200 will be used to purchase 4 Gast pumps, and \$7,000 will be spent for the supporting framework of the concentrator.
3. The total for general supplies is \$3,000 per year, including filters for testing the concentrators as well as for valves and plumbing parts related to the construction of the ultrafine concentrator.

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: University of California, Irvine

Dr. Mike Kleinman, a UC Irvine toxicologist, will conduct animal studies in preparation for field operations at the Children's Health Study sites and for the freeway study. Studies will be performed under controlled conditions using selected rat models and immunologically sensitized mice. The goals of these studies will be to test methods for performing exposures, to evaluate the sensitivity of animal models, and to select the most appropriate and sensitive biological endpoints to meet the goals of the planned studies. In addition, studies will be performed on the effects of freeway emission on the increase the severity of asthma and inflammatory responses in a sensitive animal model at two freeways, one with well-documented heavy diesel and the other dominated by gasoline traffic. An additional study will examine the effect of source and receptor site emissions in animal models.

DIRECT COSTS AND BENEFITS

11.	Labor and Employee Fringe Benefits	\$454,943 ¹
12.	Subcontractors	\$ 0
13.	Equipment	\$ 0
14.	Travel and Subsistence	\$ 15,252 ²
15.	Electronic Data Processing	\$ 0
16.	Reproduction/Publication	\$ 0
17.	Mail and Phone	\$ 0
18.	Supplies	\$47,073 ³
19.	Analyses	\$0
20.	Miscellaneous	<u>\$21,500⁴</u>
Total Direct Costs		\$538,768

INDIRECT COSTS

1.	Overhead	\$53,877
2.	General and Administrative Expenses	\$0
3.	Other Indirect Costs	\$0
4.	Fee or Profit	<u>\$0</u>
Total Indirect Costs		<u>\$53,877</u>

TOTAL PROJECT COSTS

\$592,645

¹ Total salary requested by the PI \$55,712 for years 3-5, total for a Staff Research Associate \$39,148 for years 3-5, and total for a Postgraduate Researcher \$23,886 for years 3-5.

² A total of \$15,252 is requested for travel funds to perform duties at field locations, including 100 trips to the field plus 24 trips for Dr. Kleinman to attend coordinating meetings at UCLA at 100 miles per trip and a cost of 0.41/mile = \$5084 per year.

3. A total of \$47,073 is requested for supplies, \$9,142 for antibodies and probes, \$16,948 for laboratory supplies and kits for bioassays and serum assays and \$20,983 for animals for 288 mice for the source receptor study. Each year assumes a 5% increase in the supply costs.

4. A total of \$21,500 is requested for miscellaneous costs, with \$6,000 for trailer moving and hookup, \$7,500 for computer supplies, and \$8,000 for instrument maintenance.