State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 11-14

February 24, 2011

Agenda Item No.: 11-1-1

WHEREAS, the Air Resources Board (ARB or 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 2717-270, entitled "Risk of Pediatric Asthma Morbidity from Multipollutant Exposures," 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 2717-270 entitled "Risk of Pediatric Asthma Morbidity from Multipollutant Exposures," submitted by the University of California, Irvine, for a total amount not to exceed $285,000.

NOW, THEREFORE, BE IT RESOLVED that ARB, 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 2717-270 entitled "Risk of Pediatric Asthma Morbidity from Multipollutant Exposures," submitted by the University of California, Irvine, for a total amount not to exceed $285,000.

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 $285,000.

I hereby certify that the above is a true and correct copy of Resolution 11-14, as adopted by the Air Resources Board.

Mary Alice Morency, Clerk of the Board

ATTACHMENT A

"Risk of Pediatric Asthma Morbidity from Multipollutant Exposures"

Background

Numerous studies have shown an association between asthma morbidity, including hospital admissions, and daily concentrations of ambient air pollution. However, many issues remain to be investigated regarding the nature of the exposure in these studies. For example, there is a lack of data on the health effects of traffic-related air pollutants (including ultrafine particles (UFP)) estimated at a fine spatial resolution versus regional exposure to ozone (O_3) and particulate matter 2.5 (PM2.5). Also, little is known about the health effects of two important classes of particles in California, namely: 1) primary organic aerosols (POA), which are particles that are mostly emitted directly from combustion sources; and 2) secondary organic aerosols (SOA), which are particles that are largely produced by photochemical reactions in the atmosphere. These particle types have different spatial and temporal variability and they are minimally correlated with each other in California. In addition, the differences in these particles' chemical and physical characteristics may affect their relative toxicities and differential effects in human airways. Many studies suggest a role for POA from fossil fuel combustion (e.g. polycyclic aromatic hydrocarbons) in increased airway inflammation through oxidative stress mechanisms. However, there is insufficient epidemiologic data to clarify the roles of POA vs. SOA in associations of asthma morbidity. The proposed study will address these research gaps. In addition, the United States Environmental Protection Agency (US EPA), (grant no. R833864) is supporting the development and application of the air quality models used in the proposed study. The US EPA study will provide information that the proposed study will use, thus enabling funding of this ARB contract at a lower cost.

Objective

The main objective of this proposed research is to determine the relationship between exposure to POA and SOA and asthma morbidity in a sample of 7,954 children. Exposures will be examined using particulate matter (PM) predictions, including size-resolved mass, POA and SOA and source apportionment, generated by regional air quality models. PM will be estimated for three particle sizes, including UFP, PM2.5, and PM10; along with estimates of the contributions of specific sources of PM (e.g. diesel, gasoline and wood smoke). Concentrations of other air pollutants such as O_3, nitrogen dioxide (NO_2), oxides of nitrogen (NO_X) and carbon monoxide (CO) will also be estimated. Multipollutant models will be used to evaluate whether associations of asthma morbidity with combustion-related air pollutants (UFP, POA, NO_X, and CO) are independent of associations with secondary air pollutants (SOA and O_3). It will also evaluate the association between air pollution susceptibility, including asthma recurrence and socioeconomic status and demographic factors.

Methods

The proposed study will evaluate the relationship between asthma morbidity and both local and regional air pollution. The study will use daily POA and SOA exposure data from the University of California, Davis/California Institute of Technology (UCD/CIT) Source Oriented Chemical Transport Model. Each person will act as their own control.

The model will include size-resolved mass, POA and SOA and source apportionment from multiple source categories such as diesel and gasoline engines and wood smoke. SOA and POA model estimations will be validated using particle composition data from a study of the effects of air pollution on 45 elderly subjects in three retirement communities. Other air pollutants estimated by the UCD/CIT model will include O_3, NO_2, NO_X and CO. Ambient air pollution and traffic-related air pollution will be assessed by dispersion model estimates (using real-time traffic counts and speed data, Weigh-in-Motion data and meteorological data) from on-road traffic near home addresses within a 500m radius buffer. The hospital data includes 11,390 hospital emergency department visits and hospital admissions from 2000 to 2008 made by 7,954 children ages 0 to18 years for a primary diagnosis of asthma in Orange County. The period of exposure will be the week leading up to the day each subject is seen at hospital, and this will be compared to an exposure period from the same day of the week and month as a control. The study will also assess air pollution susceptibility in children who have recurrent hospital visits. In addition, the investigators will evaluate the potential vulnerability to air pollution impacts with respect to socio-economic and demographic factors (neighborhood socio-economic status (SES), health insurance, race-ethnicity, sex and age group) in children with asthma.

Expected Results
This study is expected to provide new information on the association of asthma morbidity with exposure to multiple local and regional air pollutants. Children living in low income communities and those with recurrent need for hospital care will be studied to determine if they are more vulnerable to the effects of air pollution.

Significance to the Board
The proposed study will enable an assessment of the risk of asthma exacerbations from both local and regional air pollutant exposures. Findings will be relevant to efforts by ARB to control PM2.5 by assessing the important sources and components of PM2.5 that are related to health outcomes.

Contractor:
University of California, Irvine.

Contract Period:
24 months

Principal Investigator (PI):
Ralph J. Delfino, Ph.D.

Contract Amount:
$285,000

Basis for Indirect Cost Rate:
The State and the UC system have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:
ARB has established a strong working relationship with the principal investigator Dr. Ralph J. Delfino, which has resulted in successful completion of several studies providing new information on the health effects of air pollution.

Prior Research Division Funding to the University of California, Irvine:

Year	2009	2008	2007
Funding	$ 571,883	$ 849,703	$1,097,483

BUDGET SUMMARY

Contractor: University of California, Irvine

"Risk of Pediatric Asthma Morbidity from Multipollutant Exposures"

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	156,052	
2.	Subcontractors	$	111,566	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	600	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	200	
7.	Mail and Phone	$	1,000	
8.	Supplies	$	200	
9.	Analyses	$	0	
10.	Miscellaneous	$	1,200	
	Total Direct Costs			$270,818
INDIRECT COSTS				
1.	Overhead	$	14,182	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 14,182
TOTAL PROJECT COSTS				**$285,000**

Attachment 1

SUBCONTRACTOR'S BUDGET SUMMARY

Subcontractor: University of California, Davis

Description of subcontractor's responsibility: Air quality modeling and quality control of this aspect of the project will be conducted here. Daily modeling activities will include preparation of input data, model execution, and evaluation of model results.

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	90,505	
2.	Subcontractors	$	0	
3.	Equipment	$	5,000	
4.	Travel and Subsistence	$	4,000	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	0	
8.	Supplies	$	4,000	
9.	Analyses	$	0	
10.	Miscellaneous	$	0	
	Total Direct Costs			$103,505
INDIRECT COSTS				
1.	Overhead	$	8,061	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 8,061
TOTAL PROJECT COSTS				**$111,566**