

PROPOSED

State of California
AIR RESOURCES BOARD

Effects of Brake and Tire Wear on Particulate Matter Composition, Reactive Oxygen Species, Placental Development and Birth Outcomes in Los Angeles

RESEARCH PROPOSAL

Resolution 17-32

October 26, 2017

Agenda Item No.: 17-10-3

WHEREAS, the California Air Resources Board (CARB 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 2808-287, titled "Effects of Brake and Tire Wear on Particulate Matter Composition, Reactive Oxygen Species, Placental Development and Birth Outcomes in Los Angeles" has been submitted by the University of California, Los Angeles for a total amount not to exceed \$458,814;

WHEREAS, the Research Division staff have reviewed Proposal Number 2808-287 and finds that in accordance with Health and Safety Code section 39701, the results of this study will increase our understanding of the spatial distribution of particulate matter (PM) from brake and tire wear and its exposure related health impacts; and can help CARB protect public health by providing the evidence needed to develop well-justified control measures; and

WHEREAS, in accordance with Health and Safety Code section 39705, the Research Screening Committee has reviewed and recommends funding the Research Proposal.

NOW, THEREFORE BE IT RESOLVED, that CARB, pursuant to the authority granted by Health and Safety Code sections 39700 through 39705, hereby accepts the recommendations of the Research Screening Committee, and staff approves the Research Proposal.

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 Proposal as further described in Attachment A, in an amount not to exceed \$458,814.

Resolution 17-32

October 26, 2017

Identification of Attachments to Board Resolution 17-32

Attachment A: “Effects of Brake and Tire Wear on Particulate Matter Composition, Reactive Oxygen Species, Placental Development and Birth Outcomes in Los Angeles”
Summary and Budget Summary

ATTACHMENT A

“Effects of Brake and Tire Wear on Particulate Matter Composition, Reactive Oxygen Species, Placental Development and Birth Outcomes in Los Angeles”

Background

A large body of evidence links exposure to particulate matter (PM) to numerous adverse health effects, including birth outcomes, but most studies of health effects have been evaluated with undifferentiated particle mass concentrations. Metal components of PM can be one of the aspects of PM that contribute to the related health effects because metals can induce oxidative stress and inflammation by formation of reactive oxygen species. Non-combustion sources of PM such as brake, and to a lesser extent tire wear, can be an important source of PM-metals in urban areas, but few spatially extensive measurement campaigns have been undertaken. Although ambient PM pollution has been substantially reduced over the decades in California, especially tailpipe emissions from vehicles in response to regulatory actions, the relative contribution of non-combustion sources of PM will increase in the forthcoming years due to the lack of regulations of these sources.

Objective

The objective of the proposed study is to increase our understanding of the spatial distribution of PM metal constituents and reactive oxygen species (ROS) associated with brake and tire wear, and to use this data to better understand its relationship to adverse pregnancy and birth outcomes in Los Angeles, California.

Methods

The proposed study will develop a predictive model from a co-kriging modeling approach for metals and ROS associated with PM from brake and tire wear using identified tracers in locations associated with traffic that will then be used in evaluating effects in a pregnancy cohort study funded by the National Institute of Health (NIH). The investigators will deploy filter-based monitors to collect PM samples, and combine this information with monitoring through the NIH study. The developed model estimates will be evaluated in the pregnancy cohort study in Los Angeles, California, for associations between PM metals and ROS activity and adverse outcomes such as placental abnormalities. Also, investigators will explore the relationship between these air pollutants and other adverse birth outcomes such as pre-term birth and low birth weight using vital statistics records for all births in Los Angeles County.

Expected Results

The proposed study will measure PM metal constituents, and reactive oxygen species (ROS) associated with PM from brake and tire wear, and will generate predictive exposure layers to link with health effects such as birth outcomes and placental abnormalities. Study results will potentially fill critical gaps in knowledge about the mechanisms and potential sources behind the relationship between traffic-related air pollution and adverse birth outcomes in California.

Significance to the Board

The results of the proposed study will provide scientifically novel and policy-relevant knowledge to increase our understanding of the spatial distribution of PM metal constituents and ROS generation associated with brake and tire wear, and to help to develop control strategies of air pollution from tire and brake wear in the future.

Contractor:

University of California, Los Angeles

Contract Period:

24 months

Principal Investigator (PI):

Michael Jerrett, Ph.D.

Contract Amount:

\$458,814

Basis for Indirect Cost Rate:

The State and the UC system have agreed to a 25 percent indirect cost rate.

Past Experience with this Principal Investigator:

Dr. Michael Jerrett is an internationally recognized expert in exposure assessment and spatial epidemiology. His extensive body of research has been concentrated on how to characterize population exposure of air pollution, and how to assess the health effects from air pollution. He has conducted a similar exposure modeling study of markers of tire and brake wear in Toronto, Canada, and will be a well-qualified researcher to conduct the current project with his technical and scientific expertise. Previously, he headed CARB contract no. 06-332, titled "Spatiotemporal Analysis of Air Pollution and Mortality in California Based on the American Cancer Society Cohort" in 2011, and the final report is available on line (<https://www.arb.ca.gov/research/apr/past/06-332.pdf>).

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

| Year | 2016 | 2015 | 2014 |
|---------|------|------------|------------|
| Funding | \$ 0 | \$ 633,041 | \$ 497,281 |

B U D G E T S U M M A R Y

University of California, Los Angeles:

“Effects of Brake and Tire Wear on Particulate Matter Composition, Reactive Oxygen Species, Placental Development and Birth Outcomes in Los Angeles”

DIRECT COSTS

| | | | |
|--------------------|--|----|------------|
| 1. | Personnel (Salary and Fringe Benefits) | \$ | 292,188 |
| 2. | Travel | \$ | 11,662 |
| 3. | Materials & Supplies | \$ | 54,289 |
| 4. | Equipment | \$ | 0 |
| 5. | Electronic Data Processing | \$ | 0 |
| 6. | Consultant(s) | \$ | 10,000 |
| 7. | Subreceptient(s) | \$ | 0 |
| 8. | Other Direct Costs | \$ | <u>0</u> |
| Total Direct Costs | | | \$ 368,139 |

INDIRECT COSTS

| | | | |
|----------------------|-----------------------------------|----|------------------|
| 1. | Indirect (F&A) Costs ¹ | \$ | <u>90,675</u> |
| Total Indirect Costs | | | <u>\$ 90,675</u> |

TOTAL PROJECT COSTS

\$ 458,814

Notes:

¹ Facilities & Administrative costs.