“Protocol Development for Vehicle Emission Toxicity Testing for Particulate Matter”

Presented by Keith Bein Ph.D., Norm Kado Ph.D. and Chris Vogel Ph.D., University of California, Davis

CARB Research Seminar for Contract 14-305

March 29, 2018 1:30 PM – Sierra Hearing Room

Contract manager: Pat Wong (pat.wong@arb.ca.gov)

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Announcements

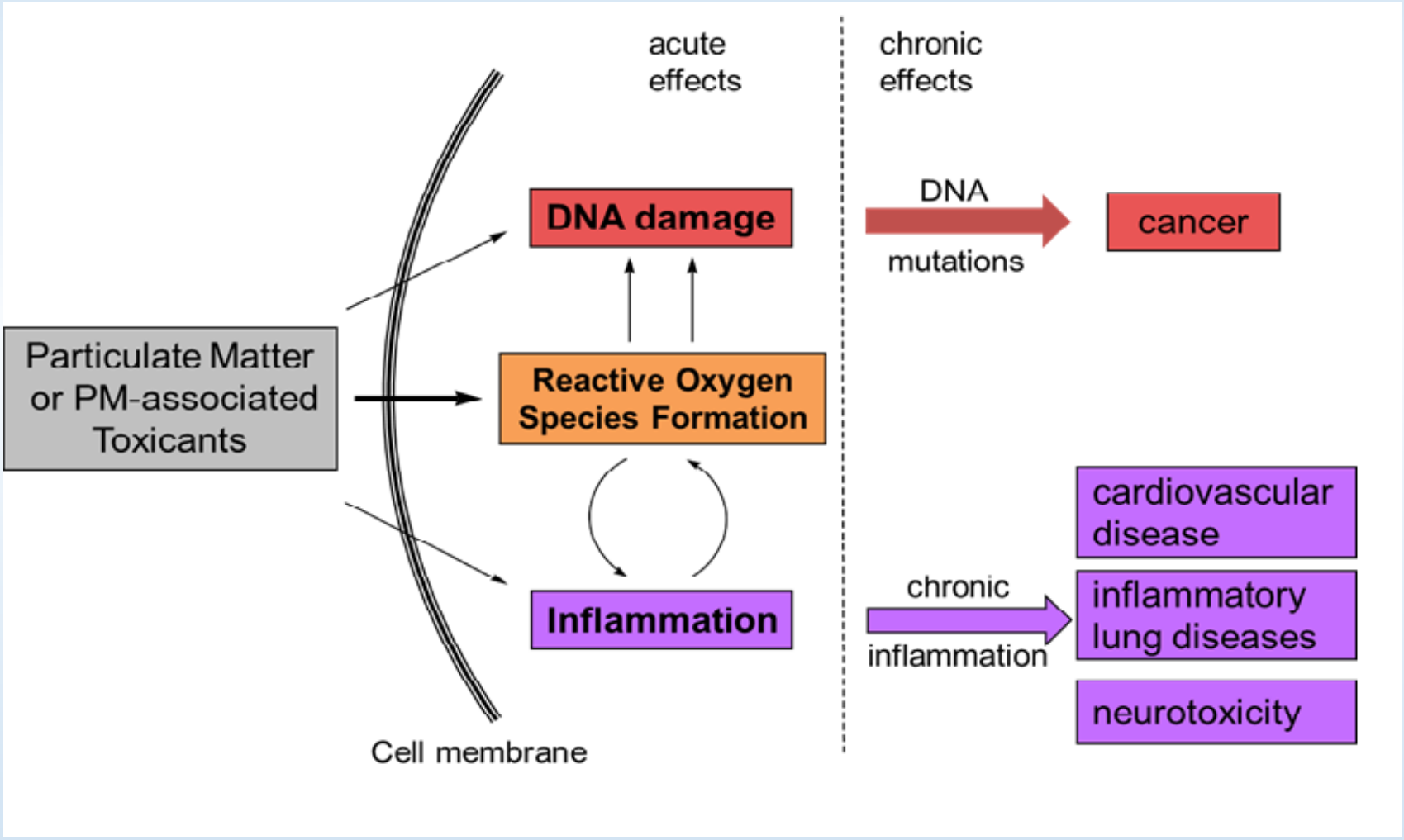
- For those of you online. Thank-you for joining us for today's seminar. Questions for the speakers can be sent to sierrarm@calepa.ca.gov

- Additional information about the speakers as well as slides and other materials can be found at this link:

https://www.arb.ca.gov/research/seminars/bein/bein.htm

- Housekeeping announcement for attendees.

Possible pathophysiological mechanisms of PM-related health effects



In Vitro Toxicology Testing

- When pathophysiological mechanisms of actions are known or speculated, *in vitro* assays can be used to compare relative toxicity of samples with regards to a particular mechanism.

- Advantages
  - Relatively inexpensive when compared to animal or human exposure studies.
  - Provide rapid information regarding relatively toxicity which may suggest potential "red flags" or pathways for further investigations.

In Vitro Toxicology Testing – Challenges

- **Interpretation of data** – There are few studies which can directly relate *in vitro* toxicology results to health effects.
  - Oxidative potential of PM is associated with increased asthma and cardiovascular related emergency room visits[1,2].

- **Standardization** – Many laboratories use similar protocols for assays but there are variations regarding procedures and sample preparations protocols.

[1] Bates et al (2015) ES&T 49(22). [2]Abrams et al (2017) EHP 125(10)

Project Overview

- **Main question:** How does sample preparation methods of PM samples affect *in vitro* toxicology results?

- **Methodology:** Prepare PM sample preparations using different protocols and test resulting preparations on a standard battery of *in vitro* toxicity assays

- **Importance for CARB:** Provide information for the basis of a standard operatory protocol (SOP) for the preparation of filter-based PM samples for toxicity assays.

Today's Speakers – Primary Investigator

Dr. Keith Bein

- Bachelor of Science degrees in Physics and Chemistry from California State University Chico.
- Ph.D. in Atmospheric Sciences at UC Davis
- Currently an Associate Professional Researcher at the Air Quality Research Center and a Research Professor at the Center for Health and the Environment at UC Davis

Today's Speakers – Co-Investigators

Dr. Norman Kado

- Bachelor degree in Biology from UC Riverside
- Ph.D. in Environmental Health Sciences from UC Berkeley.
- Currently Adjunct Professor in the Dept. of Environmental Toxicology and Staff Toxicologist at CARB

Dr. Chris Vogel

- Degree in Toxicology from the German Society of Pharmacology and Toxicology
- Ph.D. from Heinrich-Heine University in Dusseldorf, Germany.
- Currently a Research Professor at the Center for Health and the Environment at UC Davis

Project Task Division

Filter

or

NIST Std

Dr. Keith Bein (PM Extractions)

HEAT REFLUX EXTRACTION (HRE)

Polarity

1.DCM-HRE

2.TOL-HRE

3.MeOH-HRE

4. DMT*-HRE

SONICATION EXTRACTION (SE)

5.H_20-SE

6. DMT*-SE

* DMT- Extraction with three (DCM, MeOH, TOL) solvents in series

Dr. Chris Vogel (cellular response)

Inflammation (rtPCR)

AhR Activation (rtPCR)

Dr. Norman Kado (standard assays)

Oxidative stress (DTT)

Mutagenicity (Ames)