# OHVT STUDY OF COMPARATIVE TOXICITY OF ENGINE EMISSIONS: STATUS OF TOXICITY RESULTS

**Joe Mauderly and JeanClare Seagrave**

**Lovelace Respiratory Research Institute**

**Albuquerque, NM**

**William Wallace**

**National Institute of Occupational Safety and Health**

**Morgantown, WV**

# GOALS

1. Refine and validate screening tests for comparative toxicity among collected emission samples

   - Adapt established tests for this application
   - Refine for time- & cost-effectiveness
   - Compare to inhalation results

2. Apply tests to initial set of diesel and gasoline emission samples

   - Compare diesel vs. gasoline, and low vs. high-emitters
   - Consider both particle and SVOC fractions
   - Establish baseline results for comparison to other samples

# MEASUREMENTS AT LOVELACE

**A549 Cells:**
- Toxicity (survival, LDH)
- Inflammatory signaling (IL-8)
- Fibrogenic/proliferative potential (AP)

**Macrophages:**
- Toxicity (survival, LDH)
- Inflammatory/proliferative signaling (TNFa)
- Oxidant production (superoxide/peroxide)

**Salmonella:**
- Mutagenicity (revertants/ µg mass +- metabolism)

**Rats:**
- Lung Lavage
  - Inflammation (cytokines, cells)
  - Cell damage (LDH, Protein, AP)
  - Antioxidant defenses (lavage glutathione)
  - Macrophage activation (oxidants, b-gluc)
- Histopathology
  - Scores for presence & severity of changes

# MEASUREMENTS AT NIOSH

| | |
|---|---|
| **V-79 Cells:** | **DNA strand breakage (comet assay)**<br>**Chromosome damage (micronucleus assay)** |
| **Salmonella:** | **Mutagenicity (revertants/ µg mass +- metabolism)** |

# STATUS OF WORK ON INITIAL SAMPLE SET

- **The initial tests are completed**
- **Data are being analyzed for significance of responses, dose-response relationships, and differences among samples**
- **Reports/publications will be submitted soon**
- **Following completion of toxicity results, they will be merged with chemistry results to determine if features of toxicity can be related to chemical differences.**

# COMPARISON WITH RESPONSES TO INHALED EMISSIONS

- **Inhalation study of diesel emissions conducted under National Environmental Respiratory Center**
  - **Cummins ISB 5.9L turbo, HD cycle, certification fuel, dilution tunnel**
  - **Rats exposed 6 hr/d, 7 d/wk for 1 wk or 6 mo**
  - **Whole exhaust diluted to 1000, 300, 100, & 30 $\mu g/m^3$**
  - **Lavage and histopathology as in OHVT study (+ other)**
- **Particle and SVOC samples taken for toxicity tests**
- **Status**
  - **Exposure completed in June**
  - **Inhalation results being finalized & analyzed**
  - **Toxicity tests of collected samples began this month**

# SUMMARY

- Toxicity test results from initial diesel/gasoline samples will be completed soon
- Work continues to address contributions of particle and SVOC fractions
- Comparison to inhalation underway
- Extending comparisons to additional emission samples
- Preliminary results:
    1. All samples have some toxicity, but potency varies
    2. Tests do discriminate among samples
    3. Rankings may differ for different features of toxicity
    4. SVOC clearly contributes to toxicity