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**Size Distribution and Deposition in Human Respiratory Tract:
Particle Mass and Number**

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TOXICITY OF ULTRAFINES

(MAUDERLY et al.)

- **FINER PARTICLES PENETRATE MORE READILY INTO CELLS AND THROUGH TISSUE BARRIERS**
- **FINER PARTICLES HAVE GREATER SURFACE AREA PER UNIT MASS, AND A LARGE NUMBER OF TOXIC REACTIONS OCCUR AT THE SURFACE**
- **FINER PARTICLES DISSOLVE MORE READILY THAN LARGER PARTICLES THUS ENHANCING THE BIO-AVAILABILITY OF SOLUBILIZED COMPOUNDS**
- **EPIDEMIOLOGICAL STUDIES INDICATE THAT THE IMPORTANCE OF ULTRAFINES REMAINS SPECULATIVE**

OBJECTIVES

- **TO DETERMINE THE REGIONAL DEPOSITION OF PARTICULATE MATTER IN HUMAN LUNGS FOR A VARIETY OF STEADY-STATE ENGINE OPERATING CONDITIONS, FUEL FORMULATIONS AND COMBINATIONS OF AFTERTREATMENT DEVICES.**
- **TO CHARACTERIZE THE SIZE DISTRIBUTION AND MASS EMISSION RATES OF PARTICULATE MATTER EMISSIONS FROM OFF-ROAD AND ON-HIGHWAY HEAVY-DUTY VEHICLES OPERATING ON CONVENTIONAL DIESEL, AND ULTRA-LOW SULFUR SYNTHETIC DIESEL FUELS.**

BACKGROUND

- **REGIONAL DEPOSITION IS DEFINED AS THE FRACTION OF PARTICLES INSPIRED WHICH IS DEPOSITED IN THE REGION OF INTEREST.**
- **MODEL FOR POLYDISPERSED AEROSOLS (0.5 nm TO 15 μm) DEVELOPED KOBRITCH, RUDOLF, AND STAHLHOFEN (1994) WAS EMPLOYED.**
- **HOWEVER, REGIONAL DEPOSITION IN HUMANS HAS SO FAR ONLY BEEN MEASURED WITH PARTICLES WITH DIAMETERS GREATER THAN 100 nm.**