

AUTHORS: Anderson KR, Avol EL, Edwards SA, Shamoo DA, Peng RC, Linn WS, Hackney JD.

TITLE: CONTROLLED EXPOSURES OF VOLUNTEERS TO RESPIRABLE CARBON AND SULFURIC ACID AEROSOLS.

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ABSTRACT: Respirable carbon or fly ash particles are suspected to increase the respiratory toxicity of coexisting acidic air pollutants, by concentrating acid on their surfaces and so delivering it efficiently to the lower respiratory tract. To investigate this issue, we exposed 15 healthy and 15 asthmatic volunteers in a controlled-environment chamber (21 degrees C, 50 percent relative humidity) to four test atmospheres: (i) clean air; (ii) 0.5-microns H₂SO₄ aerosol at approximately 100 micrograms/m³, generated from water solution; (iii) 0.5-microns carbon aerosol at approximately 250 micrograms/m³, generated from highly pure carbon black with specific surface area comparable to ambient pollution particles; and (iv) carbon as in (iii) plus approximately 100 micrograms/m³ of ultrafine H₂SO₄ aerosol generated from fuming sulfuric acid. Electron microscopy showed that nearly all acid in (iv) became attached to carbon particle surfaces, and that most particles remained in the sub-micron size range. Exposures were performed double-blind, 1 week apart. They lasted 1 hr each, with alternate 10-min periods of heavy exercise (ventilation approximately 50 L/min) and rest. Subjects gargled citrus juice before exposure to suppress airway ammonia. Lung function and symptoms were measured pre-exposure, after initial exercise, and at end-exposure. Bronchial reactivity to methacholine was measured after exposure. Statistical analyses tested for effects of H₂SO₄ or carbon, separate or interactive, on health measures. Group data showed no more than small equivocal effects of any exposure on any health measure.