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COMPARISON OF PULMONARY-FUNCTION OF EXERCISING DOGS INHALING O-3 ALONE OR A MIXTURE OF O-3, SO2, AND ACID AEROSOL

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COMPARISON OF PULMONARY FUNCTION OF EXERCISING DOGS INHALING O_3 ALONE OR A MIXTURE OF O_3, SO_2, AND ACID AEROSOL. William J. Mautz*, Michael T. Kleinman*, Charles Bufalino*, and Robert F. Phalen. Univ. of Calif., Irvine, CA 92717.

Adult beagle dogs were exposed to 3 atmospheres: 1) Clean air; 2) 0.6 ppm O_3; and 3) Aged (0.5 h) mixture of 0.6 ppm O_3, 5 ppm SO_2, 1 mg/m^3 H_2SO_4, 0.02 mg/m^3 $MnSO_4$, and 1.2 mg/m^3 $Fe_2(SO_4)_3$. Dogs (n=5) wore a low deadspace mask with an esophogeal balloon, and ran on a treadmill at 5 km/h and 7.5% grade for 120 min during exposure. Inspiratory and expiratory flow rates, respiratory gas fractions, skin and rectal temperatures, and transpulmonary pressure were continuously recorded for breath-by-breath computation of $\dot{V}_E$, $\dot{V}_{O2}$, $\dot{V}_{CO2}$, breath time, expired tidal volume, and a dynamic measure of pulmonary resistance and lung compliance. In both test atmospheres, dogs developed a progressive change in breathing pattern toward rapid-shallow respiration. However in O_3 alone, onset of response was earlier (40 min vs. 80 min in mixed atmosphere) and the magnitude of response (%change relative to clean air) was greater at the end exercise exposure: breath time decreased 47% in O_3 and 36% in the mixture, and expired tidal volume decreased 42% in O_3 and 30% in the mixture. During the last half of exposure to both atmospheres, pulmonary resistance increased by 37% and compliance declined by 40%. We conclude that inhalation of an ozone atmosphere containing SO_2 and acid aerosol delays development of rapid-shallow breathing response to ozone, but does not significantly modify ozone induced changes in resistance or compliance in a 2 h exposure. Supported by EPRI #RP1962-1 and EPA #R808267.