



STATEMENT

Synopsis of Research Report 100

HEALTH
EFFECTS
INSTITUTE

Effects of Mexico City Air on Rat Nose

BACKGROUND

Residents of southwestern Mexico City are exposed to a mixture of air pollutants (ozone, formaldehyde, acetaldehyde, particulate matter, polycyclic aromatic hydrocarbons, and other hydrocarbons) not found in other areas of the city. Pathologists have found evidence of cell damage and inflammation in nasal tissue from some residents of this highly polluted area that was not present in people living in areas of the country with cleaner air. This finding prompted HEI to support a collaborative study to determine whether the effects of Mexico City air on humans could be replicated in rats. If so, rats could serve as sentinels to detect the effects of air pollutants on human nasal tissue. The collaboration involved researchers from the Chemical Industry Institute of Toxicology (CIIT; original Principal Investigator Dr Kevin Morgan, later Dr Owen Moss), Michigan State University (Dr Jack Harkema), and the Instituto Nacional de Pediatría (INP) in Mexico City (Dr Lilian Calderón-Garcidueñas, who had conducted the human studies).

APPROACH

Most studies of the health effects of air pollutants on laboratory animals are performed by controlled laboratory exposures to a single pollutant. In this study, the laboratory was Mexico City and its ambient air was the exposure atmosphere. Moss and coworkers at CIIT constructed mobile exposure chambers designed to expose rats to either ambient southwestern Mexico City air or to air from which

pollutants would be removed by a filtration system. The investigators exposed rats to unfiltered or filtered Mexico City air for 23 hours/day for 21, 35, or 49 consecutive days. They examined the animals' respiratory tract for evidence of tissue damage using histopathology and state-of-the-art morphometry.

RESULTS AND INTERPRETATIONS

Moss and colleagues demonstrated the feasibility of using specially designed exposure chambers to study the effects of ambient air on laboratory animals. They found no significant differences in the nasal tissue of rats exposed to unfiltered or filtered air for up to seven weeks. Several possible interpretations could explain the lack of effect of Mexico City air on rats compared with humans. Pollutant levels may have been too low (or the exposure times too short) to affect the rats. In this study, the mean levels of ozone and formaldehyde during the daytime period of highest pollution were lower than those inducing nasal lesions in controlled exposures of laboratory animals. Alternatively, because the anatomy and physiology of rodent and human nasal passages differ significantly, human nasal tissue may be more susceptible to the pollutant mixture than rat tissue. Further research should explore the validity of each interpretation to determine whether bioassays using rat tissue are appropriate for assessing the effects of air pollutants on humans.

Respiratory Tract Toxicity in Rats Exposed to Mexico City Air

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INVESTIGATORS' REPORT

Owen R Moss, Elizabeth A Gross, R Arden James, Derek B Janszen, Paul W Ross, Kay C Roberts, Andrew M Howard, Jack R Harkema, Lilian Calderón-Garcidueñas, and Kevin T Morgan

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CRITIQUE Health Review Committee

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**HEALTH
EFFECTS
INSTITUTE**

955 Massachusetts Avenue
Cambridge MA 02139 USA

+1-617-876-6700

+1-617-876-6709 fax

pubs@healtheffects.org

www.healtheffects.org

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