

Scientific Basis of the California Ambient Air Quality Standard for Nitrogen Dioxide

Air Quality Advisory Committee
Report to the California Air Resources
Board
February 22, 2007

Background

- Children's Environmental Health Protection Act required ARB and OEHHA to review all health-based ambient air quality standards.
 - Protective of susceptible populations including infants and children
 - Adequate Margin of Safety
 - Prioritization of standards for full review

Air Quality Advisory Committee

- Independent Committee
- Appointed by the Office of the President of the University of California (UCOP).
- Members selected to provide range of experience and knowledge relevant to NO₂ and its effects on health.
- Each candidate investigated for possible Conflict of Interest before appointment by UCOP.

Committee Experience and Knowledge

- Exposure Assessment and Pollutant Monitoring
- Medicine
 - Pulmonary
 - Pediatric
- Epidemiology
- Health Effects, Toxicology and Biological Mechanisms
- Economics and Health Benefits Analysis

Committee Charge

- Was the review of the literature comprehensive and accurately interpreted?
- Were susceptible populations appropriately considered?
- Are the observed effects sufficiently adverse to be a basis for short-term standards?
- Will infants and children be adequately protected by the recommended standards?
- Have the uncertainties been adequately considered?
- Was the overall approach to developing the 1-hr and annual ambient nitrogen dioxide standards transparent and appropriate?
- What are the data gaps and additional studies that might be helpful for the next revision of the NO₂ standards?

Key Studies

- Relevant studies ID'd and interpreted?
 - Review was comprehensive.
 - Some recommendations were provided and modifications were made.
 - The committee supported the overall conclusions and modifications provided additional justification of methodology used to develop standards.

Susceptible Populations

“The committee was particularly impressed with the efforts taken in the preparation of the reviewed documentation to thoroughly evaluate what is presently known about the effects of NO₂ on the health of children.”

- The report reviewed the literature relevant to susceptible populations
- Effects of NO₂ on Healthy Individuals indicated no effects at potentially worst-case exposure levels.
- Individuals with airway allergies and asthma were among the most sensitive.
- Individuals with COPD and Cardiovascular Diseases were evaluated.
 - Data are suggestive
 - Few studies and small subject numbers
- Infants and children were considered.
 - Few data were available
 - More data needed on *in-utero* exposure and neonates

Uncertainties Were Adequately Addressed

- Health Effects
- Monitoring
- Co-linearity with other pollutants

Exposure Assessment

- NO₂ is not distributed uniformly in the environment.
- Current monitors are not located to provide data that would be spatially representative of exposures (including “hot spots”).
- In-vehicle exposures were also considered.
- These issues were considered with respect to margin of safety.

AQAC Finds Proposed Standards Are Protective

- The Committee Endorses the Recommendations for a Long Term Standard
 - Annual Average NO₂ at 0.030 ppm
 - Not to be exceeded
- The Committee endorses the reduction of the 1-hr standard to a level below the current 0.25 ppm NO₂
 - SR recommends a 0.18 ppm 1-hr average standard (not to be exceeded).
 - The Committee strongly endorses a 1-hr standard as the appropriate averaging time to capture acute events.
- The NO₂ monitoring network should be augmented to provide better spatial resolution and include monitoring of “hotspots”.

Additional AQAC Recommendations

- Committee identified areas of needed research prior to next Review.
 - Dose-response Relationships
 - Application of more sensitive endpoints (i.e. exhaled NO as a marker of inflammation), imaging methods to evaluate physiological responses) to define responses at levels below 200 ppb.
 - Effects of peak exposures are not well established.
 - In-utero and neonatal exposures
 - There are too few studies currently to determine exposure-response relationships

Future Research

- Monitoring
 - Personal exposure
 - Other oxidant gases
- Health
 - Susceptible populations, especially in utero, premature, newborn, infant and early childhood and adolescent.
 - New indicators of biological response.
 - Cardiovascular as well as pulmonary endpoint data in individuals with heart disease and diabetes.

Acknowledgements

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Membership

- William Adams
- Ralph Delfino
- Russell Sherwin
- Katherine Hammond
- Lauraine Chestnut
- Dean Sheppard
- Michelle Fanucchi
- Peter Green
- Arnold Platzker
- Charles Plopper
- Michael Kleinman,
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