



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

December 10, 1980

OFFICE OF  
THE ADMINISTRATOR

SUBJECT: Scientific Review by the Clean Air Scientific Advisory  
Committee of the Air Quality Criteria for Hydrocarbons

FROM: Sheldon K. Friedlander, Chairman  
Clean Air Scientific Advisory Committee  
Science Advisory Board

A handwritten signature in cursive script, reading "Sheldon K. Friedlander".

TO: Douglas M. Costle  
Administrator

On March 17, 1980, the Clean Air Scientific Advisory Committee reviewed a scientific document that addressed the major scientific issues associated with ambient level exposures of hydrocarbons. The document entitled, Facts and Issues Associated with the Need for a Hydrocarbon Criteria Document, was produced by the Office of Research and Development to fulfill section 109(d)(1) of the 1977 Clean Air Act requirement to update the air quality criteria for the national ambient air quality standard for hydrocarbons. The purpose of this memorandum is to summarize the major findings, recommendations, and comments provided by the Committee to assist you in reviewing the data necessary for reaching regulatory decisions on gas-phase hydrocarbons in the ambient air.

Major Issues Pertaining to the Hydrocarbon Document

Three major scientific issues regarding the hydrocarbon document were discussed and evaluated by the Committee. These included:

1. Do gas-phase hydrocarbons, as a class, contribute to the formation of ozone and other photochemical oxidants?
2. Can the attainment and maintenance of a uniform, nationwide ambient air concentration of volatile nonmethane hydrocarbons ensure the attainment and maintenance of the ambient ozone standard?
3. Do gas-phase hydrocarbons, as a class, cause adverse effects on public health or welfare at or near ambient air levels?

Issue #1 Gas-phase hydrocarbons and the formation of ozone and other photochemical oxidants

The Committee agreed that the scientific evidence supports the premise that gas-phase hydrocarbons, as a class, do contribute to the formation of ozone and other photochemical oxidants. The data indicate that all hydrocarbons participate in these chemical reactions but the reactivities of the various hydrocarbons differ with respect to the different oxidant products. As a result, a general relationship between oxidant formation and total hydrocarbon (or non-methane hydrocarbon) concentrations, valid across the nation, cannot be obtained.

The Committee requested incorporation of information in this and other documents (e.g. the sulfur oxides/particulate matter criteria document now in progress) on the role of hydrocarbons in ozone formation and their role as generators of chemical species that also affect other atmospheric processes, such that control strategies are formulated with the several impacts of hydrocarbons in mind. In particular, the action of various radicals on the oxidation of methane in the presence of nitrogen dioxide, and the process by which peroxide radicals act in the formation of acidic precipitation by oxidation of sulfur dioxide in cloud and rain water should be included in any evaluation of controls required for hydrocarbons.

Issue #2 Attainment and maintenance of an ambient air concentration of volatile non-methane hydrocarbons and its relationship to attainment and maintenance of an ambient ozone standard.

This issue is closely related to issue #1. Hydrocarbon emissions and ambient air levels are only two of many variables in the atmospheric processes that result in the formation of ozone and other photochemical oxidants. Other variables include the emissions of other reactive gas-phase organics, and meteorological and geographical factors such as temperature, humidity, wind speed, latitude and longitude, and topography. Because of the many variables and uncertainties discussed under issues #1 and #2, no fixed level of gas-phase nonmethane hydrocarbons can be used to ensure the attainment and maintenance of the ozone standard. However, based upon the evidence which the Committee reviewed in the document, the Committee concluded that the document adequately identifies, discusses, and evaluates studies in the current literature. The Committee identified some minor issues regarding presentation of the information, but these comments are included in the transcript.

Issue #3 Health and welfare effects of ambient level hydrocarbons.

There was general agreement among Committee members that hydrocarbons at ambient levels, with the exception of benzene and ethylene, do not cause adverse health and welfare effects, respectively. Benzene has been listed as a hazardous air pollutant under section 112 of the Clean Air Act and regulatory actions are proceeding. There are adverse effects upon vegetation from ethylene, but, even though ethylene is ubiquitous, these effects have not been measured in all parts of the country, partly because the more susceptible species (ornamentals) are not grown in all parts of the country; the issue should not be dismissed, however, on the basis that adverse vegetative effects from ethylene are not a national problem.

Summary

The Clean Air Scientific Advisory Committee agrees with the Agency's conclusion that, in the absence of a uniform quantitative relationship nationwide between hydrocarbon emissions and ambient air levels and resulting ozone-oxidant ambient air levels, there is no scientific basis for maintaining a national ambient air quality standard for hydrocarbons. The Committee also agrees with the Agency's conclusion that, because of the absence of ambient-level adverse health or welfare effects from hydrocarbons, no new basis exists for an ambient air quality standard for hydrocarbons. Public health and welfare will continue to be protected even in the absence of a national ambient air quality standard for hydrocarbons. Recision of a national ambient hydrocarbon standard should also beneficially act to streamline the regulatory process.

The Committee urges, however, that efforts continue to assess and where necessary to control harmful compounds. The control of emissions for hydrocarbons as a class remains essential as a convenient method of controlling ambient levels.

The Committee made additional comments of an editorial nature and requested further information on the results of source reconciliation studies showing contributions of various source categories to hydrocarbons in ambient air in one or more cities or airsheds. They also requested the inclusion of information on (1) the possible role of the oxidation of methane and carbon monoxide in the photochemical production of ozone; (2) the effect of radicals generated from hydrocarbons

on the conversion of sulfur dioxide to sulfate; and  
(3) the identification of specific gas-phase hydrocarbons known to be precursors to secondary organic aerosols. With the understanding that the requested changes are included in the revised document, the Committee is satisfied that the document meets the requirements of section 108 of the Clean Air Act as amended.