

Environmental Health Associates, Inc.

4 October 1984

Dr. Michael Cardin
Union Oil Company of California
461 South Boylston Street
Los Angeles, CA

Dear Dr. Cardin:

A draft of our review of the Department of Health Services (DHS) document, "Part B: Health Effects of Benzene" was sent to you on 24 September 1984. We are in the process of preparing a final report of our review, which should be ready in several weeks. In the interim, we would like to summarize the major points of our review in this communication.

First, contrary to the DHS document, we do not find any epidemiologic evidence of association between benzene and lung cancer. Second, in our opinion, the DHS document does not provide a convincing argument for the DHS choice of a particular, also the highest, risk estimate based on an animal study. Third, we have carefully reviewed the three epidemiologic studies used by EPA's Carcinogens Assessment Group (CAG), and found the CAG had most likely overestimated the risk associated with benzene exposure. Thus, contrary to the DHS assessment, risk estimates based on epidemiologic studies are lower than those from the animal studies reviewed by DHS. Finally, the statement in the DHS document that "occupational studies based on exposed males will underestimate the effect of benzene when the results are extended to the general population ... because women and children weigh less ..." is speculative and not supported by current evidence.

As mentioned above, the DHS document suggested lung cancer as another site that might be associated with an increased risk as a result of benzene exposure. The document stated, "only one epidemiological study, that of Environmental Health Associates [1983], examined all causes of cancer in male workers possibly exposed to benzene. Interestingly, this study demonstrated a positive trend for higher overall cancer incidence and higher lung cancer incidence in exposed

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workers..." This statement has a number of inaccuracies. Since we conducted the study, we feel that it would be appropriate for us to clarify the issue of lung cancer and benzene exposure.

In addition to the EHA 1983 report, there are other publications reporting all causes of death for individuals exposed to benzene. Examples include Ott et al [1978], Decoufle et al [1983], and Tsei et al [1983]. Many studies based on rubber workers and refinery workers also reported all causes of death. Examples include Monson and Nakano [1976], McMichael et al [1976], Schottenfeld et al [1981], Environmental Health Associates [1984], and Hanis et al [1982].

Regarding the EHA [1983] benzene study, we want to point out that it did not examine incidence; it was an historical cohort mortality study. More importantly, the EHA [1983] study did not demonstrate a positive trend for either all cancers combined or for lung cancer. The following table shows the Standardized Mortality Ratios (SMRs) for all cancers, and lung cancer by cumulative benzene exposure.

Cause	Cumulative Exposure [ppm-months]		
	<180	180-719	720+
All Cancers	102.5	129.4	77.8
Lung Cancer	125.4	173.7*	64.8

*Statistically significant at the 0.05 level

It is obvious from these SMRs that neither cause of death shows a positive trend. In fact, the group with the highest exposure (720+ ppm-months) experienced considerable deficits in all cancers and lung cancer.

The group with 180-719 ppm-months of exposure had a statistically significant SMR for lung cancer when compared to the U.S. males. However, the excess could be attributed to a plant located in a county with unusually high lung

cancer rates. This information was transmitted to DHS by Chemical Manufacturers Association (CMA) [see Attachment], but was not included in the DHS document.

To further examine the issue of lung cancers and benzene exposure, we reviewed some other epidemiologic studies and the following is a summary of our review:

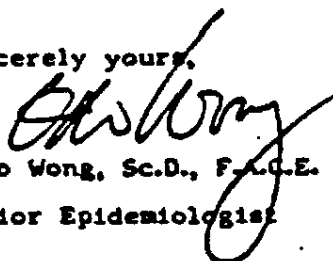
Author	Exposure	Lung Cancer SMR (Observed/Expected)
Ott et al [1978]	Benzene	111 (7/6.3)
Tsai et al [1983]	Benzene	52 (2/3.88)
Decoufle et al [1983]	Benzene	31 (1/3.21)
Hanis et al [1982]	Refinery	91 (60/66.0)
Schottenfeld et al [1981]	Refinery	68 (37/83.37)
EHA [1984]	Refinery	67 (124/185.42)
Monson and Nakano [1978]	Rubber	92 (234/253.1)
McMichael et al [1974]	Rubber	84 (91/109.3)

Based on the above discussion, we do not feel that there is any epidemiologic evidence supporting the argument for a positive association between exposure to benzene and lung cancer. The DHS argument was based on a single statistical finding for a subgroup in the EHA [1983] study, which, as explained to DHS previously, was primarily due to the unusually high lung cancer rate in a county where one of the participating plants is located [see Attachment]. The DHS suggestion that benzene might cause lung cancer has profound ramifications for the public health. Therefore, that suggestion must be examined in detail.

In summary, we feel that the risk estimate provided by the DHS document, which is based on a very selected risk estimate from an animal study, represents an overestimate, and is not consistent with findings from existing epidemiologic studies.

If you have any questions about this summary or our draft report, please feel free to call on me.

Sincerely yours,



Otto Wong, Sc.D., F.A.C.E.

Senior Epidemiologist

OW:jdd

cc: Robert Harrison

Enclosure