STATEMENT OF
EDWARD J. BAIER

ACTING DIRECTOR
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CENTER FOR DISEASE CONTROL
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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ON

PROPOSED STANDARD FOR OCCUPATIONAL EXPOSURE TO INORGANIC ARSENIC
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16. Abstract (Limit: 200 words) This testimony before the U.S. Department of Labor concerned carcinogenic effects of occupational exposure to inorganic arsenic (7440382). NIOSH has reviewed all the independent studies available and, taken together, it appears that it is undeniable that there have been carcinogenic effects which must be attributed to this metal. This has prompted a reevaluation of earlier recommendations and the OSHA proposal which resulted from these recommendations. NIOSH now concludes that a 24 hour time weighted average consisting of excursions above and below the mean of 2.0 micrograms per cubic meter of air may be excessive. A recent study indicated no excess cancer mortality among orchardists exposed to lead-arsenate (10102484) spray, but these results do not prove consistent with findings from independent data sources investigated by NIOSH. Because of the unique problems of exposure and acute toxicity associated with arsine (7784421), its inclusion in the NIOSH recommended standard poses special problems in that some specific work practices are needed as is a sampling method. NIOSH has cosponsored an exchange of ideas at a National Conference on Health Effects of Occupational Lead and Arsenic Exposure. The evidence currently available points to the conclusion that all inorganic compounds of arsenic must be regarded as occupational carcinogens.

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b. Identifiers/Open-Ended Terms NIOSH-Publication, NIOSH-Author, NIOSH-Testimony, Baier-E-J, Carcinogens, Arsenic-compounds, Agricultural-chemicals, Insecticides

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In January 1974, NIOSH transmitted to the Department of Labor a criteria document on Occupational Exposure to Inorganic Arsenic. At that time it was apparent that inorganic arsenic had been a factor in the development of occupationally related lung cancer, but the evidence was not unequivocal. However, NIOSH acted because of the seriousness of the disease. Even in the absence of data demonstrating the absolute safety of the recommended environmental limit of 50 micrograms of arsenic per cubic meter of air, it was believed that this limit would "at the minimum, significantly reduce the incidence of arsenic-induced cancer."

Beginning in July 1974, unpublished reports of carcinogenic effects of occupational exposure to inorganic arsenic were made available by the Allied Chemical Corporation, The Dow Chemical Corporation, and by Kennecott Copper Corporation. NIOSH reviewed these papers and several additional reports that were published after the inorganic arsenic criteria document was completed. Each report, if taken alone, has its limitations. However, when all reports of occupational exposure to inorganic arsenic are considered together, NIOSH believes it undeniable that there have been carcinogenic effects which must be attributed to inorganic arsenic. Consequently, on November 8, 1974, NIOSH transmitted to the Department of Labor modified recommendations for an inorganic arsenic standard. New information presented at the Conference on Occupational Carcinogenesis, sponsored in March 1975 by NIOSH and the New York Academy of Sciences, by Fraumeni and also by Newman indicate that 24-hour time-weighted average exposures of approximately 2.0 micrograms per cubic meter may be excessive. Therefore, we have reevaluated our November 8 recommendations and the OSHA proposal resulting from them.

We know of no data that describe the short-term variability in the natural background arsenic concentration. EPA air quality data suggest that some areas have 24-hour average background concentrations of more than 2.0 micrograms per cubic meter of air, and some quarterly averages may approach or even exceed 1.0 microgram per cubic meter of air. Where they occur as a result of air pollution, these high concentrations may create problems in enforcement for OSHA, but they cannot be considered natural. Using the data and assumptions in the study by Ott and others, Blejer and Wagner calculated 8-hour time-weighted averages that after a 40-year working life would result in the total doses of arsenic as reported in the Ott paper. As Blejer and Wagner reported at the March 1975 meeting of the New York Academy of Sciences Conference on Occupational Carcinogenesis, their calculations suggested that lung cancer mortality would be twice the expected mortality at a projected daily 8-hour time-weighted average exposure of 3.0 micrograms per cubic meter. At the same New York meeting, Newman and others reported significantly increased lung cancer among male and female residents of Anaconda, Montana, and suggested that the increase might be due to pollution of the air with arsenic. Also at the New York meeting, Fraumeni reported an increase in average lung cancer mortality rates for counties of the United States in which there are arsenic-emitting nonferrous smelters. In view of these recent developments, NIOSH must conclude that a 24-hour time-weighted average consisting of excursions above and below the mean of 2.0 micrograms per cubic meter of air may be excessive. It is our position that no 15-minute breathing zone sample should exceed 2 micrograms of arsenic per cubic meter of air. We believe this to be the only recommendation consistent with the currently available occupational exposure data and the background levels.

A number of other recommendations in the November 1974 modifications differ from those in the January 1974 document. Additional medical tests have been included. Proposed labels and warning signs contain the words "cancer causing agent." Where there is occupational exposure to inorganic arsenic, only supplied air respirators or self-contained breathing apparatus are to be used for respiratory protection. Standby rooms under positive air pressure with a filtered air supply are also proposed. Medical records and records of the results of environmental monitoring are to be maintained for at least 30 years after an individual's employment is terminated.

While the original criteria document excluded arsine and lead arsenate from its recommendations, the November 1974 modifications made no such exclusions, but rather were intended to apply to all inorganic compounds of arsenic. Although the physicochemical properties and the acute toxicity of inorganic arsenicals vary widely, there is no evidence to support a contention that some inorganic arsenicals are carcinogenic while others are not. Occupational cancer has been associated with smelter workers' exposure to trivalent arsenic, and with pesticide plant workers' and vinedressers' exposure to trivalent and pentavalent arsenic. A recently published study by Nelson and others indicated no excess cancer mortality among orchardists exposed to lead arsenate spray in a 3-county area in Washington, but these observations are not consistent with independent data sources investigated by NIOSH. Therefore, the study by Nelson and others cannot be cited as conclusive evidence that certain compounds of arsenic--that is, lead arsenate--are not carcinogenic. It is not known whether occupational exposure to organic compounds of arsenic

results in carcinogenesis, since we know of no studies that address this question. NIOSH concluded that in the virtually complete absence of data on occupational exposure to organic arsenicals, it would be inappropriate at this time to label this class of compounds as carcinogens.

Because of the unique problems of exposure and acute toxicity associated with arsine, its inclusion in the NIOSH recommended standard poses special problems in that some specific work practices are needed, as is a sampling method. However, these problems should not be cited as cause for permitting continued exposure to arsine at 0.05 ppm (equivalent to approximately 150 micrograms of arsenic per cubic meter of air). Arsine should be controlled to the same levels as other inorganic arsenicals. NIOSH is developing the needed recommendations that are specific for arsine and will transmit them directly to OSHA as expeditiously as possible.

NIOSH recognizes that many questions regarding the biologic activity of the various chemical forms of arsenic remain unanswered. To stimulate the exchange of ideas and to encourage research on these questions, NIOSH in February 1975 co-sponsored a National Conference on Health Effects of Occupational Lead and Arsenic Exposure. Part of the Conference was devoted to the issue of the carcinogenic activity of arsenic. As previously mentioned, NIOSH was also a co-sponsor of the New York Academy of Sciences' March, 1975 Conference on Occupational Carcinogenesis. NIOSH will continue to assume a leadership role in these and other occupational health issues. However, when a hazard has been as clearly identified as has occupational exposure to inorganic arsenic, less than decisive action would be unconscionable. We cannot delay action while seeking the answers to all

questions. In our opinion, the evidence now in hand requires that all inorganic compounds of arsenic be regarded as occupational carcinogens and that appropriate controls be implemented immediately.

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