



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

June 11, 1979

MEMORANDUM FOR: R. C. DeYoung, Deputy Interim Director
NRC/TMI Special Investigation Group

FROM: Allen Brodsky, Sc.D., C.H.P.
Senior Health Physicist
Occupational Health Standards Branch, SD

SUBJECT: REPORT ON PARTICIPATION IN THREE MILE ISLAND (TMI)
ACTIVITIES

Attached is a report summarizing my activities, observations, and some of my opinions with respect to the Three Mile Island accident. Although major revisions in design, operational, training, and emergency planning requirements (including ours) are in order, the accident proved the effectiveness of the containment building concept. My own estimates of health effects of the accident are consistent with those of the May 10 NRC-HEW-EPA staff report referenced in my report to the President's Commission.

Allen Brodsky
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Senior Health Physicist
Occupational Health Standards Branch
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Enclosure: As stated

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REPORT ON THREE MILE ISLAND ACTIVITIES - ALLEN BRODSKY

I. AS AN NRC EMPLOYEE

A. Advice Concerning Evacuation, Thursday, March 29, 1979

At approximately 4 p.m. Thursday, March 29, 1979, I was told by Walt Cool that I was to join others in a meeting in Karl Goller's office. I went immediately and Mr. Goller discussed the question of advising the Governor of Pennsylvania regarding evacuation of the population in the vicinity of the Three Mile Island Unit 2 reactor. A number of opinions were expressed by others. After considering the status of the reactor and the radiation measurements found at that time in the environment, which indicated to me that only xenon-133 had been released in any quantity, I recommended that evacuation should not be advised for any of the population, unless there were real indications that significant quantities of at least iodines would be released. I felt that after the initial period any further releases would be at least controllable or slow enough that limited evacuations could be accomplished later after better preparations. Also, I felt that the risk of an immediate evacuation, under the conditions of hysteria and confusion propagated by contradictory public pronouncements, would be greater at that time than the risk of radiation exposure to the public. Mr. Goller thanked all of us and the meeting ended about 45 minutes after it had been convened.

B. Assistance with Messages at the IE Incident Center, EW Towers

On Tuesday, April 3, I was requested to report to the IE Incident Center that evening for duty, assisting with the receipt and translation of messages on environmental reports from Three Mile Island. I generally assisted by manning the telephone at the desk receiving the environmental reports and passing messages to other desks. After going to the IE Incident Center Tuesday afternoon from about 1:30 p.m. to 3:30 p.m. in order to be briefed on my duties, I worked only Tuesday evening from 11 p.m. to 7 a.m. the following morning and Friday evening from 11 p.m. to 7 a.m. the following morning due to an intervening illness. On Tuesday evening I also prepared myself for any questions and evaluations regarding environmental releases and checked my own fission product inventory calculations from my chapter in the Handbook of Radioactive Nuclides with those of the ORIGEN computer. I found them to be in reasonable agreement. Also, I had a request to furnish any information on the radionuclide concentrations in one of the waste water tanks. I stated that the only values I had seen were for iodines but that we would request further information. One individual became disturbed about advising the states about release of this waste water without having further analyses to advise them on the cesium 137 and other nuclide contents. I advised that we could easily deduce from the analyses of the primary coolant and other data that any cesium 137 content of the waste tank would be a small fraction of maximum permissible concentrations than for the iodine concentrations, with respect to the iodine MPC's.

Further, I advised the State Program representative that I believed the concentration in the waste tank was low enough (as I recollect, it was on the order of 4×10^{-5} $\mu\text{c}/\text{ml}$ iodine-131) that if the waste water were dumped into the river, the radioactivity would become many orders of magnitude less than maximum permissible concentrations for drinking water in unrestricted areas. I don't know how my advice affected any recommendations to outside agencies.

Aside from some indirect work in regard to Three Mile Island, such as involvement with Commission correspondence and helping the Inspector Auditor's office with translation of taped interviews, I had no other direct official involvement with the accident.

II. Voluntary Assistance

On Saturday, March 31, at approximately 4 p.m., I drove from Pittsburgh, PA, to Hershey, PA, arriving at the home of Mr. Kenneth Miller, Director of Health Physics, Hershey Medical Center, to advise and assist him in preparations for possible evacuees or contaminated workers from Three Mile Island. I remained at Hershey until the evening of Monday, April 2, as a volunteer and provided some guidance regarding emergency preparations and briefed the medical staff of the hospital on Monday morning to help orient the staff in regard to handling contaminated patients and to alleviate fears regarding their ability to deal with the situations that were likely to arise. A report requested by Mr. Miller to the President's Commission is attached describing my assistance to the Hershey Medical Center.

The only other activities relevant to the Three Mile Island accident were some talks in which I presented my opinions regarding the accident and one appearance on Channel 6 TV in Miami, Florida, on a one-hour talk show confronting Dr. George Wald, May 13, 1979. All of these activities were done as an individual professional, and remarks stated as such were identified to the audiences.

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HANDBOOK of RADIATION MEASUREMENT and PROTECTION

EDITOR

Allen Brodsky, Sc.D.

Please reply to:

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May 28, 1979

TO: The President's Commission on the Accident at Three Mile Island
FROM: *Allen Brodsky*
Allen Brodsky, Sc.D., C.H.P.
SUBJECT: REPORT ON ACTIVITIES AND OBSERVATIONS DURING PERIOD OF ASSISTANCE
AT HERSHEY MEDICAL CENTER, MARCH 31-APRIL 2, 1979

At the request of Mr. Kenneth Miller, Director, Division of Health Physics, Hershey Medical Center, I went to the Hershey area on Saturday afternoon, March 31. Mr. Miller had indicated to me by telephone that he may be in need of considerable expert assistance in the event that contaminated or exposed workers or members of the public should arrive for treatment or decontamination at the Hershey Medical Center. Since I had considerable experience in the handling and evaluation of contaminated patients as former Technical Director of the Radiation Medicine Department, Presbyterian-University Hospital, and Associate Professor of Health Physics, University of Pittsburgh, as well as experience in emergency planning and operations in former positions with the Federal Civil Defense Administration and the U.S. Atomic Energy Commission, I felt it my professional and civic duty to provide my assistance and advice to Mr. Miller.

Before going to Hershey, I telephoned Mr. Ronald Kathren of Richland, Washington, a friend and well-known health physicist with emergency experience, to alert him regarding the possible need for additional health physics assistance at Hershey and to request that he inform Mr. Carl Unruh, also of Richland, and the current President of the Health Physics Society, of this need so he could provide contacts to appropriate health physicists in the Eastern United States. Mr. Kathren returned my call to my Pittsburgh residence and told me there would be various DOE and NRC teams in the Middletown area that could provide assistance, and that Mr. Unruh was flying to D.C. on Sunday and could be contacted there if further specific assistance was needed from the Health Physics Society.

At 4 p.m., Saturday, March 31, I left Pittsburgh to drive to Hershey. On the way, I heard various radio reports that indicated there may be an imminent danger of a serious release of radioactivity from the TMI-2 plant. After several futile attempts to obtain radiation survey equipment from friends on the way out of Pittsburgh, I finally stopped at a State Police barracks near the Pennsylvania Turnpike and obtained a 0 - 200 R pocket chamber from an officer at the desk, so that I would be alerted if I should be driving in the open through any seriously radioactive plume or fallout pattern. The reports from the media, including statements by Dr. Ernest Sternglass and Dr. George Wald, had given me cause for serious concern.

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When I arrived at 10 p.m. at Mr. Miller's home, approximately 6 miles East of Three Mile Island, I turned on a G-M survey meter in his living room and noted that external radiation levels were in the normal background range. I also checked my pocket chamber and found that it had registered no gamma radiation exposure. News reports were still posing the possibility of a hydrogen explosion in the reactor vessel and the possibility of meltdown of fuel.

On Sunday, April 1, I inspected the hospital preparations for receiving radioactively contaminated patients with Mr. Kenneth Miller and Mr. Louis Rubin, another health physicist who had joined Mr. Miller some days earlier. They had prepared hoses near the emergency entrance to decontaminate large numbers of people who might evacuate to the Hershey area, and had prepared a room in the emergency area to carry out more thorough decontamination and possible surgery or medical treatment for any injured, contaminated persons. The normal capacity at Hershey Medical Center for handling accident cases from the Three Mile Island plant would be no more than 2-3 contaminated workers at one time.

I spent most of Sunday and Monday listening to news reports, and making calculations of potential doses to members of the public from the various postulated fission product releases. I also provided Mr. Miller with some levels of food and water contamination that could be used for limited periods of intake in the event of a major release that would require utilization of all available resources, while ensuring that no one would be likely (with more than about 1% probability) to receive serious internal doses that would cause harm. The information used to provide this guidance was taken from several of my chapters in the Handbook of Radioactive Nuclides, edited by Yen Wang, CRC Press, 1969, since Mr. Miller had received no official guidance on emergency contamination limits at that point. (I later checked the fission product inventories in my chapter versus those generated for NRC by the ORIGEN code at ORNL, and found good agreement for the fission products of radiobiological importance.)

On Monday morning, I was requested to attend a medical staff briefing on the Three Mile Island accident to explain the nature of radiation risks and procedures for alleviating injury. Some of the medical staff had already evacuated the area with their families, and it was important that the remaining staff be properly briefed and ready to take care of the remaining patients and those that might arrive as a result of any injuries during a mass evacuation.

After very competent briefings in regard to the hospital procedures by the director of the emergency room, Mr. Miller, and other hospital supervisors, I was invited to present a briefing on the nature of the incident, the nature of the radiation risks, and ways in which radiation injury could be minimized. I presented my estimation that, even in the event of a major fission product release from the reactor vessel, it was unlikely that very much of the fission products would be released from the containment building. If the filters should fail, mainly the volatile iodines and rare gases would contribute to the population dose. Thus, I indicated that, in my own opinion, the worst possible case they might be confronted with would be that in which a major portion of the iodines were released to the environment. I explained that

even in the event that the iodines were released from the reactor vessel, I did not believe that most of the iodines would actually escape the containment building, since they would be mostly contained in the coolant water. Furthermore, much of the iodine entering the vapor in the building would be likely to react with the building walls or with other components in the building, and only a fraction of the iodine would escape to the environment. Nevertheless, I explained, if one postulates that a major portion of the iodines were released to the environment, they could produce thyroid doses of up to hundreds of thousands of rads to persons outside the plant area under unfavorable weather conditions. My calculations on rare gas inventories indicated that even if all of the rare gases were released this would not pose serious problems for the surrounding population and for the Hershey Medical Center. Much of the short-lived rare gas activity had already been dissipated. I explained further that although thyroid doses of hundreds of thousands of rads to members of the public would also imply that hundreds of rads would be received by the whole body, once these persons were decontaminated according to Mr. Miller's procedures, there would be no appreciable risk to the medical staff in working with these patients. I reminded them that hospitals are accustomed to treating persons for thyroid carcinomas to doses from I-131 of approximately this magnitude, and that the limited amounts of I-131 contamination emitted from the body are easily controlled routinely in most hospitals of the United States today.

I also pointed out to the staff that if they feared an unexpected release might occur without sufficient warning, they would be better off to stay within the massive structure of the hospital where several underground floors are available, including areas of the Radiation Therapy Department where the cobalt and linear accelerator rooms are shielded by 3 or more feet of concrete. With a temporary shutdown of the ventilation system of the hospital, the hospital could provide excellent protection against a passing radioactive cloud. I illustrated the protection possible by giving experiences of my own after the Castle hydrogen bomb tests at Eniwetok, and experiences in the managing of patients with large amounts of contamination by highly radiotoxic nuclides at Presbyterian-University Hospital, University of Pittsburgh. I again emphasized, however, that no massive release of radioactivity from Three Mile Island had occurred, and that amounts of radioactivity released at that time should not be of serious concern.

The only additional suggestion I had to Mr. Miller's preparations were that he should have on hand a multi-channel analyzer and gamma ray spectrometer for evaluating contaminated articles, food samples, and patients. However, he had already ordered this kind of equipment and he and Mr. Rubin were preparing to set it up on Monday evening. Thus, on Monday afternoon when I felt that I had provided all the advice necessary and reports indicated to me that the reactor situation was heading toward stabilization, I decided to return home to Bethesda so that I could report back to my job at the NRC the next day.

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I would particularly like to call attention at the end of this report to the attached article by Dr. Ernest Sternglass, which is written to make it appear that I supported his view that the NRC covered up the radiation releases. As indicated above and as indicated in my attached rebuttal to Dr. Sternglass' article and his statements at meetings, I have not even talked with Dr. Sternglass since the Three Mile Island accident and I do not support his views. The information he presents in his writeup is taken from a 1965 article of mine in Health Physics, where I calculated synergistic and cumulative effects to populations based on releases of major proportions of radioactive inventories of operating reactors. The 1965 article presenting these calculations is the same one that I used in preparing some of the materials in the chapter of the Handbook of Radioactive Nuclides, from which I estimated maximum consequences of the Three Mile Island accident. Dr. Sternglass' assertions are based on calculations that assume full fission product release. I have stated emphatically, not only at the Hershey briefings but in other talks since the TMI accident, that only a small fraction (actually far less than 1 million n) of the radioactivity in the reactor was released, and that I can verify this fact based on my own observations. In fact, if one considers possible radiation doses and risks to the population rather than fractional radioactivity, it is my estimation that the containment building was an outstanding success and provided protection factors of well over a billion, as it was designed to do. In fact, I believe that the measurable consequences of the Three Mile Island accident now prove that the containment building would have protected the public from the types of consequences predicted by Dr. Sternglass and Dr. George Wald on television and in many newspapers (see attachments), even if there had been a complete release of all fission products from the reactor vessel itself (and I do not believe that this would have occurred to 100% completion under any circumstances.) Further, I support the risk estimates* made by the ad hoc committee of NRC and other agencies' staff members. I also believe the risk estimators used by the NRC are consistent with the recent recommendations of the Committee on the Biological Effects of Ionizing Radiations, National Academy of Sciences (BEIR), in regard to the upper limits of risks for use in calculating radiation health effects.

Thus, the new BEIR committee recommendations also effectively reject recent claims by T. F. Mancuso and others that they have found risks much greater than previous expert committees have estimated. This rejection is consistent with my own testimony and evidence presented at Congressional hearings in 1978, and further supports the risk estimates of NRC and other agencies. (This is my own independent professional judgment. I had no role in preparing the NRC-EPA-HEW report* on Three Mile Island.)

Attachments: As stated

* L. Battist, J. Buchanan, F. Congel, C. Nelson, M. Nelson, H. Peterson, M. Rosenstein, "Population Dose and Health Impact of the Accident at the Three Mile Island Nuclear Station," U.S. Nuclear Regulatory Commission, Department of Health, Education, and Welfare, and Environmental Protection Agency, May 10, 1979 (for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington; D.C. 20402).

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