

OAK RIDGE NATIONAL LABORATORY

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NUCLEAR DIVISION



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**ORNL**  
**FOREIGN TRIP REPORT**  
ORNL/FTR-392

DATE: June 19, 1978

SUBJECT: Report of Foreign Travel of Chester R. Richmond, Associate Director for Biomedical and Environmental Sciences, Central Management Offices

TO: Herman Postma

FROM: C. R. Richmond

PURPOSE: To discuss reassessment of Project Indalo for the Department of Energy with staff of the Junta de Energia Nuclear in Madrid, present draft materials prepared for report being prepared for the Organization for Economic Co-Operation and Development/Nuclear Energy Agency Committee on Radiation Protection and Public Health in Paris, visit the IAEA Marine Radiobiology Laboratory in Monaco, and participate in the International Commission on Radiation Protection meeting in Stockholm.

SITES VISITED:	5/15-17/78	JEN	Madrid, Spain	E. Iranzo
	5/17-19/78	OECD/NEA	Paris, France	E. Wallauschek
	5/20-21/78	IAEA	Monaco	C. L. Osterberg
	5/22-27/78	ICRP	Stockholm, Sweden	B. Lindell/ J. Vennart

ABSTRACT: Discussions with Dr. Iranzo at the JEN concentrated on scoping programmatic and budgetary requirements for expanding Project Indalo over a five-year period should the occasion arise for an accelerated effort. Information from this visit was summarized and used as a basis for extensive discussion on June 6 at Lawrence Livermore Laboratory with the other two members of the U.S. Advisory Group on Project Indalo. A revision of the planning document discussed at Livermore will be forwarded to the Advisory Group around July 1, 1978. Dr. Iranzo agreed to visit the U.S. for approximately 30 days beginning in mid-July for the purpose of summarizing the available data on Project Indalo for publication.

I discussed the subject of actinide levels in the Mediterranean with IAEA staff at Monaco. Dr. Osterberg will send me available information on the level of plutonium and other actinides in the Mediterranean for possible inclusion in a paper being prepared for OECD/NEA. Apparently, the specific interest in the Rhone River and its contribution to the inventory of actinide elements to the Mediterranean is a mildly sensitive issue to the French.

Discussions with the Expert Group and the other OECD/NEA consultant working on the document entitled "Biological and Environmental

Behavior of Plutonium" for the OECD/NEA committee on Radiation Protection and Public Health were useful and productive. Dr. Masse's (France) contribution on the "Metabolism and Biological Effects of Plutonium and Some Other Transuranium Elements" will be rescoped and partially rewritten with the assistance of one member of the Expert Group (Hylton Smith, Harwell). Only relatively minor revisions will be required for my contribution entitled "Environmental Behavior of Plutonium and Transfer to Man." Portions of the draft document were mailed to DOE Headquarters' staff well in advance of the Paris meeting. The next meeting will be held at OECD/NEA in October 1978.

The ICRP meeting in Stockholm centered around the 1977 ICRP Publication Number 26. This publication represents a significant change in the basic philosophy for radiation protection guides that are recommended to organizations and nations in many parts of the world, particularly Europe. Of particular significance is the fact that this was the fiftieth anniversary of the ICRP. The major discussions of all attendees centered around topics such as the biological basis for the Commission's recommendations, the Commission's system of dose limitation, methods of dose optimization (theory, examples, problems, and constraints), derived limits (external and internal), and the concepts, quantities and units now used by ICRP. The main Commission also grappled with the somewhat embarrassing situation whereby ICRP Number 26 (underlying philosophy) has been in print since 1977, yet the implementation of this radiation protection philosophy in terms of annual limiting intakes and derived air concentrations are still not available. Major activities of Committee 2, of which I am a member, were devoted to discussing ways of making the Committee report and ALI and DAC values available within the next several years and identifying new activities to be undertaken by Committee 2 during the next several years. It is of critical importance that resources be made available in the U.S. to accelerate calculation of ALI and DAC values to be used by the ICRP for implementing basic philosophy contained in ICRP Number 26.

#### Junta de Energia Nuclear, Madrid, Spain

The purpose of this portion of my trip was to visit with Dr. Emilio Iranzo of the JEN to discuss the reassessment of Project Indalo. Following my visit to the JEN in the fall of 1977, I submitted a trip report to DOE Headquarters which led to extended discussion with DOE/ASEV and his staff concerning the possibility of a complete reassessment of Project Indalo. The general outline of the reassessment was initiated and I agreed to visit the JEN enroute to other business in Paris (OECD/NEA) and Stockholm (ICRP annual meeting). I also discussed a time for Dr. Iranzo to visit the U.S. so that a complete analysis of all the available data related to Project Indalo could be undertaken prior to publication in the technical literature. He agreed to visit the U.S. for approximately four weeks beginning in July of this year to accomplish this purpose. While in the U.S., Iranzo will also meet with various technical individuals to discuss the possibility of a ground area survey at Palomares. Iranzo will also be attending a meeting in Albuquerque, New Mexico, on uranium tailings piles during his visit to the U.S. (sponsored by OECD/NEA).

We also discussed the plans related to the follow-up of human subjects involved with the Project Indalo studies. These were reported in my trip report of last year. We agreed to enlarge the study groups from six to ten individuals each for a total of about 60 people to be studied each year. Of these, 40 would be selected from the 1500 or so residents of Palomares. Ten of the 60 would have no connection with Palomares and would represent a control group. Ten of the 60 would be JEN employees who were at Palomares during the initial cleanup. These subgroups would be studied intensively for at least the next five years. Information obtained should allow decisions to be made concerning the extent of internal contamination. These data would be reviewed annually by the six members of the technical groups from the U.S. and Spain.

We also discussed the situation as regards air sampling station 2-1 which has been out of operation since 1969. This sampling location was situated to sample possible pickup and movement of material from the untreated hillside near Impact Point 2. It is important that all of the original four air sampling stations be re-established. Iranzo has agreed to obtain estimates for the cost of stringing a power line from the village area to Area 2 within the next month or so. There will also be a need to upgrade the sampling stations per se (as well as a need for additional air sampling to be initiated in support of some field experiments that may be conducted at Palomares). Portable generators could be utilized for these shorter term applications.

I met with Mr. Pascual, General Director of the JEN, while visiting there on May 16. He is still very interested in Project Indalo and would personally like to see an expansion of efforts during the next several years. Pascual emphasized the large contribution of resources and support from the JEN, but also made it clear that he is very appreciative of the U.S. effort related to Project Indalo.

In general, I found a receptive and cooperative attitude at the JEN, as I have experienced in earlier years. However, I detect a change in that there is as much or perhaps more interest in what is happening as regards nuclear energy in Europe as compared with the U.S. If my perceptions are correct, this marks a distinct and decided difference from attitudes which have previously prevailed. I believe we still have good rapport and excellent relations with the JEN and these should not be allowed to diminish or erode in any way.

It appears that the U.S. efforts related to support of Project Indalo could be significantly expanded during the next few years. Iranzo could easily supplement his activities through the use of students (pre-doc and post-doc candidates) so that he does not have to over staff for the period of a few years during which accelerated field and laboratory efforts could take place.

I prepared a document based on my recent visit to the JEN for discussions with DOE and other personnel at Livermore, California, on June 6. It is for this reason that my foreign trip report is late. The input from the June 6 meeting will be used to revise the working document which will be submitted to DOE Headquarters by the end of July.

Iranzo was very pleased that the alpha-spectrometers (12 units) are almost completely fabricated (LASL and Livermore working together). The current

schedule calls for the alpha-spectrometers to be shipped to Spain around the end of July. Arrangements are now being made with the U.S. Embassy in Madrid to expedite the shipment of the materials to Spain and the JEN. Iranzo also expressed an opinion on the pulse height analyzers to be used in the future. He feels that better maintenance can be obtained for the Canberra Systems as compared to the Nuclear Data analyzers. I discussed this item subsequently with personnel at the Lawrence Livermore Laboratory. It appears that they are now committed to the Nuclear Data System.

We discussed in more detail the needs for a solid state (GeLi) detector system for measuring americium-241 and other radionuclides in soil, air, and vegetation samples. We also made plans for sampling and measuring tissues obtained from domestic and wild animals as part of Project Indalo. It is interesting to note that the increased cost of living for the last several years has been approximately 20% per year. U.S. funding for this effort, except for the current fiscal year, has been level for a period of approximately seven years.

#### OECD/NEA, Paris, France

I visited the OECD/NEA Headquarters in Paris to discuss the draft document I had prepared for the OECD/NEA Committee on Radiation Protection and Public Health. This document and one prepared by Dr. R. Masse from France was the major input to the document under discussion by the expert group convened by the Committee on Radiation Protection and Public Health. I had been invited to contribute to a document to be entitled "The Biological and Environmental Behavior of Plutonium." The introductory sections will be prepared by OECD/NEA staff. Dr. Masse and I are responsible for the major technical contents. Dr. Wallauschek is in charge of the preparation of the document and is assisted in this role by Dr. Ferruccio Gera.

Several weeks prior to the Paris meeting, a draft version of my chapter was sent to Drs. B. W. Wachholz and G. R. Shepherd in DOE/ASEV. The major purpose of this document is to provide factual information on the biological and environmental behavior of plutonium to political and non-scientific leaders in the various communities served by OECD.

The draft chapter I prepared will be reorganized substantially by removing many of the actual examples of environmental contamination from the body of the chapter and incorporating them into an appropriate appendix. Much of the introductory material from my chapter will also be removed and will serve as a general introduction to the entire OECD report. I also delivered to Drs. Wallauschek and Gera some relatively simplified information on decay schemes for various plutonium isotopes to be used in the final report. There will also be some relatively minor revisions of portions of my draft chapter and some inclusions which will be prepared specifically by members of the Expert Group that reviewed the document. Dr. Clemente (Italy) will attempt to provide a summary table containing the properties of plutonium and its associated behavior in soil for various site-specific cases of contamination. Dr. Frissel (The Netherlands) will also prepare a table containing various mechanical and physical properties of soils. Frissel will also attempt to restructure several paragraphs concerning the effects of microorganisms and soil structure on plutonium in the environment. The

section on resuspension will also require some clarification and revision.

The draft manuscript prepared by Dr. Masse will be completely restructured and rewritten with significant assistance to be supplied by Dr. Hylton Smith of Harwell (U.K.). It was decided by the group that Masse's contribution was much too technical and indeed attempted to develop radiation protection philosophy and guides that differ from those promulgated by organizations such as ICRP. Most attendees pointed out that the major activity associated with the revision of both chapters will be associated with a need for simplification to accommodate the anticipated audience. However, virtually all the discussion throughout the Paris meeting was of the nature of additions rather than suggestions of shortening or simplifying the document.

The group decided to wait until the ICRP meeting following the week in Stockholm before recommending any values for the gastrointestinal uptake for plutonium and other transuranic elements. I agreed to supply the most recent ICRP thinking on the subject for the document under consideration since I am a member of ICRP Committee 2. Dr. Wallauschek expressed a strong interest in this item and others related to ICRP recommendations in the field of radiation protection, since he is an observer at ICRP meetings for OECD/NEA. Wallauschek planned on attending the meeting in Stockholm the following week.

I was very interested to note that the members of the Expert Group wanted to supply additional information concerning the environmental contamination from plutonium and other actinide elements from their countries. Drs. Fitossi and Clemente in particular agreed to supply me with information. In addition, Dr. Hylton Smith agreed to supply me with the most recent information from Windscale reports on contamination of the Irish Sea from actinide releases from the Windscale facility.

The following schedule was agreed to for revision and completion of the report. Various individuals would send materials to Dr. Gera by the end of June. Gera in turn will distribute materials related to my chapter as he receives them from several members of the Group. Dr. Masse feels that he cannot complete a rewrite of his section until September. Dr. Gera will send the revised manuscripts to the Expert Group in late September. We set the next meeting of the Group for October 1978. Wallauschek hopes to provide a finished report to the Committee on Radiation Protection and Public Health for consideration at their December 1978 meeting. It is possible that the Expert Group may need to meet again in February or March 1979 to discuss the Committee's comments. The next meeting of the Committee on Radiation Protection and Public Health is scheduled for April 1979. Wallauschek would like to have the report finalized and approved by the Committee by May 1979. I see no problems in meeting this deadline as regards the draft chapter prepared, but there is concern that Dr. Masse may have difficulties meeting the schedule for the revision.

Dr. Clemente invited me to visit his facility at Casaccia in Italy during my next trip to Europe to present information and lectures on the toxicity of plutonium and actinide elements.

I had several private discussions with Drs. Wallauschek and Gera who were interested in possible future activities for the Committee to consider. Dr. Wallauschek seemed to be quite interested in the possibility of a future Committee effort on the subject of our current state of knowledge of body burdens and contamination levels for workers exposed to plutonium and actinide elements. The purpose of such a report would be to update and document the world experience accrued from actual working environments. There may also be an opportunity for the U.S. to contribute significantly to OECD/NEA activities related to the disposal and management of nuclear wastes. One area in particular might be that of supplying technical information from data bases now available in the U.S. There may be useful additions to these data bases from experience accrued in other parts of the world. It is not certain how much of the total information is available from the U.S. data bases. This needs to be discussed with individuals at ORNL.

IAEA, Marine Radiobiology Laboratory, Monaco

I toured the IAEA Marine Radiobiology Laboratory with Dr. Osterberg and was briefed as to their primary mission and current programs. Originally, the Laboratory was concerned with radioactivity in the marine environment with special emphasis on the Mediterranean. More recently, their mandate has been expanded and research and development is conducted for nonnuclear pollutants in the marine environment. The Laboratory contains excellent equipment for the measurement of radioactivity in aqueous samples. I met Dr. Fukai who is an accomplished radiochemist and has many years' experience of measuring plutonium and actinide elements in marine samples. We discussed the draft report prepared for OECD/NEA and Dr. Fukai agreed to supply information on the concentration of plutonium in the Mediterranean. Apparently the levels of plutonium and other actinides are approximately four to five times higher than fallout levels for samples taken from the Rhone River. Apparently the French are somewhat sensitive about this information.

Dr. Osterberg was sent information concerning Project Indalo and we were able to discuss the subject in some detail. Drs. Osterberg and Fukai had no real knowledge of the Project Indalo. This is quite surprising considering the proximity of the Monaco Laboratory to Palomares. I told Dr. Osterberg that I would discuss his interests and capabilities in environmental contamination and suggest that Iranzo may want to contact Dr. Osterberg to discuss the overall situation. Dr. Fukai would be interested in the comparison of data from samples measured for actinide elements. I think there are numerous areas in which mutual discussions between Osterberg and his staff and Iranzo and his colleagues would be useful.

Dr. Fukai is also going to check to see if any measurements of plutonium had been made in the vicinity of the Southeast Coast of Spain. This might be particularly interesting since the Almanzoro River, which is normally dry, flooded in 1973 and washed large quantities of soil (including one of the study plots in Area 3) out into the Mediterranean. Dr. Fukai is obtaining measurements of americium in marine samples obtained from the Mediterranean. He has developed a very sensitive analytical procedure for americium detection using large volumes of water and he also measures americium-241 following its ingrowth from plutonium-241.

I provided Dr. Osterberg with a copy of the draft document I prepared for OECD/NEA and he has agreed to provide me with a review of the document.

#### ICRP Meeting, Stockholm, Sweden

The ICRP meeting was particularly interesting since it marked the fiftieth anniversary of the founding of the ICRP which also took place in Stockholm. I have appended a list of the members of the main Commission to this report.

The meeting was divided such that all members of the ICRP could meet each morning for a joint session prior to breaking up into smaller groups comprised of the major committees. The first day was devoted entirely to business of all members of the Commission, partly because of the large number of new members. A large number of new members, including myself, were elected to the ICRP at the annual meeting of the International Congress of Radiology held last fall in South America. One entire joint session was spent discussing ICRP Publication 26 which was published in 1977. Comments from the membership of ICRP on ICRP Publication 26 were collected and divided into five categories which included errors, gaps, textual improvements, major points and policy, and points subject to misinterpretation. It is proposed to issue a statement following the Stockholm meeting which would contain corrections of errors which appeared in ICRP 26. Points subject to this interpretation that might lead to difficulty of comprehension or lead to misinterpretation will be considered in detail prior to any future revisions of ICRP 26. Comments from members collected prior to the Stockholm meeting are available as a document identified as ICRP-78/G-2 (March 22, 1978).

Other introductory joint sessions were held on Monday, May 22. These included a session on the background and history of ICRP in terms of what it is and what it does. Another joint session was devoted to a review of ICRP policy. The individual committees met on Tuesday afternoon and all day Wednesday, Thursday, and Friday, except for the half hour general sessions in the morning beginning at 9:00 a.m. Committee 2 had its final session with the main Commission on Friday afternoon to discuss its progress and a draft report which had been prepared for that session.

A large amount of discussion centered around the risk estimates used in ICRP 26. Many people, including myself, feel that the background information necessary to derive such estimates is not available for consideration by the reader. Later, during the meeting, it was pointed out that Committee 1 will begin working on a report which will provide a background for the risk estimates that were used in ICRP 26. These values are similar, but not precisely the same, to those which appear in the 1977 UNSCEAR report.

Another major problem which surfaced during the main Commission meetings was related to the fact that ICRP 26 was published in 1977 as a major recommendation of the Commission. Thus, major policy and primary guidance for radiation protection has been available for some time, yet the means of implementing this guidance for the worker or indeed the general public are not available. Values similar to the old maximum permissible concentrations are needed by numerous organizations including the IAEA, WHO, ILO, and OECD/NEA. These values, Annual Limiting Intakes and Derived Air Concentrations, are primarily the responsibility of Committee 2 and its working group on dose calculations. Some of the activities of this group were delayed because of the death of the working group's chairman, Dr. Walter Snyder.

Committee 2 now has its report ready for the printers and, hopefully, the calculations, methodology, and philosophy related to implementation of ICRP 26 should be available within the next six months or so. There is considerable unhappiness within ICRP that this report has been delayed so long. I agreed to both the main Commission and to Committee 2 to personally work with the task group members at Oak Ridge to accelerate progress on the calculation of ALIs and DACs. The working group needs to be supplemented by individuals who can assist in this effort even though they are not formally members of the ICRP working group. I have agreement with members of Committee 2 and others within ICRP that this can and indeed should be done. There is major concern within ICRP that some organizations which are basically unhappy with the guidance contained in ICRP will use the fact that ALIs and DACs are not available as an argument to avoid acceptance of the policies contained in ICRP 26. Some individuals on the main Commission feel that the ICRP is in an extremely vulnerable position which requires that action be taken as soon as possible. I was approached separately by Dr. H. Daw and J. Horan, both of the IAEA. Both are interested in trying to find out why such long delays have been encountered by Committee 2.

The remedial action which I plan to carry out at ORNL is to initiate an internal dosimetry panel that can meet periodically and consider radiation dosimetry problems including those of interest to ICRP and its task group. We will also get a member of the task group to visit and work at ORNL for a period of three or four months beginning in September of this year (Dr. Dillman).

The next meeting of the Commission will be held during the week of March 17, 1980, in London, England, following the Jerusalem meeting of the International Radiation Protection Association.

Committee 2, of which I am a member, considered in some detail its report which has been in various draft stages for many years. There will still be opportunity to make changes for a short period of time following the meeting in Stockholm. I have subsequently provided information to the Committee Secretariat that will be added to the Committee 2 report. The report in essence will contain the calculations and methodology and principles used by Committee 2 to calculate the ALIs and DACs, in compliance with the basic principles and numerical values detailed in ICRP 26. Another section of the report will contain metabolic data for the first 22 elements to be considered. The metabolic data for each element are in effect contained in a short essay so that the reader can identify the numerical values used in calculating the ALI and DAC values. On the average, there will be about eight radionuclides associated with each element (with their associated ALI and DAC values). The report will also contain a summary sheet listing the ALI and DAC values that are available at the time of the printing of the Committee 2 report. There will be a separate supplement to the report containing six tables for each of the individual radionuclides. There will be approximately 1000 tables for the first 22 elements considered. There will also be a separate publication of the decay scheme data which were provided by the dosimetry task group.

There was a discussion concerning the gut absorption factors for the actinide elements. The basis for this discussion was a note prepared by members of

the National Radiological Protection Board at Harwell. The Committee finally agreed to the following absorption factors for the gut: Plutonium - Class W (soluble)  $10^{-4}$ ; plutonium - Class Y (insoluble)  $10^{-5}$ ; americium (all compounds)  $5 \times 10^{-4}$ . Appropriate changes must also be made for all other transplutonium actinides.

The Committee also considered the dosimetric data sheets for 30 additional elements. Numerous members of the Committee need to supply updated information to the secretariat on many of these 30 elements.

New work of the Committee will include updating and expanding the data given in ICRP 17 (Protection of the Patient in Radionuclide Investigations). This effort will center on a revision of the earlier report to include new materials which have come into use since 1971. The final report should also contain the best estimates of the dosimetric and metabolic data for each compound including the dose calculations. The report should also consider variations stemming from size of the individual (whether a child, adult, or a fetus) and various pathological situations that might affect metabolism. It is quite obvious that ORNL can contribute significantly to this major effort and I have offered assistance in several areas directly to Professor Kaul and Dr. Nosslin who will be heavily involved in this effort.

The Committee will also begin consideration of the methodology that might be used in calculating ALIs and DACs for members of the general public. There is a similar effort underway within the U.S. ICRP Committee 57. Proper liaison between these two efforts will be established.

The Committee 2 Secretariat had completed provisional calculations of ALIs to get some estimate as to how these might differ from MPC values now in existence, i.e., those calculated from information given in Publication 2. It is of considerable interest that the majority of the ALI values appear to fall within the factor of approximately 2 of the old values. It is also quite interesting and perhaps surprising that more than half of the ALI values were limited because of non-stochastic effects including a number of the more soluble compounds.

There are no current plans to revise Publication 23 on Standard Man. As information accrues on this topic, it will be kept together at the Oak Ridge National Laboratory. I agreed to discuss the current status of the project with Mr. G. S. Hill at ORNL.

There was also a discussion of radon exposure within Committee 2 that was led by Dr. Jacobi. Ultimately this report should provide the basis for a long-overdue official ICRP statement on radon.

The main Commission was advised by Committee 2 that the bone dose dosimetry model currently used by the Commission may be in error. The current model is based on the supposition that the sensitive cells are contained within a ten micron thick layer over bone surfaces. The main Commission was advised that the earlier adoption of this dosimetric model for surface seekers may have been premature.

The next meeting of Committee 2 will be held April 23-27, 1979, at Harwell.

## APPENDIX

ITINERARY

May 13-14, 1978	Travel from Oak Ridge, Tennessee, to Madrid, Spain
May 15-16, 1978	Project Indalo, Junta de Energia Nuclear, Madrid, Spain
May 16, 1978	Travel from Madrid, Spain, to Paris, France
May 17-19, 1978	Organization for Economic Co-Operation and Development/Nuclear Energy Agency, Paris, France
May 19, 1978	Travel from Paris, France, to the Principality of Monaco
May 20-21, 1978	International Laboratory of Marine Radiobiology, Principality of Monaco
May 21, 1978	Travel from Principality of Monaco, to Stockholm, Sweden
May 22-27, 1978	International Commission on Radiological Protection, Stockholm, Sweden
May 28, 1978	Travel from Stockholm, Sweden, to Oak Ridge, Tennessee

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LITERATURE ACQUIRED

1. Working Document on Uptake of Plutonium and Other Transuranium Elements from the Gastrointestinal Tract, National Radiological Protection Board, Biology Division, Harwell, U.K.
2. Recommendations of the Commission on Radiation Protection on the Toxicity of Inhaled Hot Particles with Special Reference to Plutonium, Radiation and Environmental Biophysics 15:1-11 (1978)
3. ICRP Booklet (contains membership of International Commission on Radiological Protection and committees)
4. Working Document entitled Metabolism and Biological Effects of Plutonium and Some Other Transuranium Elements prepared by Dr. R. Masse for OECD/NEA Expert Group on the Biological and Environmental Behavior of Plutonium (Committee on Radiation Protection and Public Health)



## APPENDIX

ICRP/78/G-1  
February, 1978

## INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

## Composition of Commission and Committees

1977-1981

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