COVER SHEET
FOR TRIP REPORTS SUBMITTED TO THE
OFFICE OF ENERGY RESEARCH

Destination(s) and Dates for Which Trip Report Being Submitted: Madrid, Spain
November 25-December 4, 1990

Name of Traveler: R. Julian Preston

Joint Trip Report ☐ Yes
☒ No

If so, Name of Other Traveler(s): _____

OAK RIDGE NATIONAL LABORATORY

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ORNL

FOREIGN TRIP REPORT

ORNL/FTR--3845

DE91 006018

DATE: December 17, 1990

SUBJECT: Report of Foreign Travel of R. Julian Preston, Senior Research Staff Member, Biology Division

TO: Alvin W. Trivelpiece

FROM: R. Julian Preston

PURPOSE: To attend 1st International Conference on Biological Dosimetry, Madrid, Spain, from November 30-December 1, 1990, and to present the introductory lecture entitled "Biological Dosimetry: Mechanistic Concepts." The traveler also visited the Department of Radiopathology and Radiotherapy at the Hospital General "Gregorio Maranon" Madrid, Spain, on December 3, 1990, to provide advice and discuss several occupational radiation overexposure cases.

SITES VISITED:

11/30-12/1	1st International Conference on Biological Dosimetry, Madrid, Spain
12/3	Hospital General "Gregorio Maranon" Madrid, Spain

ABSTRACT: The traveler attended the 1st International Conference on Biological Dosimetry in Madrid, Spain. This conference was organized to provide information to a general audience of biologists, physicists, radiotherapists, industrial hygiene personnel and individuals from related fields on the current ability of cytogenetic analysis to provide estimates of radiation dose in cases of occupational or environmental exposure. There is a growing interest in Spain in biological dosimetry because of the increased use of radiation sources for medical and occupational uses, and with this the anticipated and actual increase in numbers of overexposure. The traveler delivered the introductory lecture on "Biological Dosimetry: Mechanistic Concepts" that was intended to provide a framework by which the more applied lectures could be interpreted in a mechanistic way. A second component of the trip was to provide advice with regard to several recent cases of overexposure that had been or were being assessed by the Radiopathology and Radiotherapy Department of the Hospital General "Gregorio Maranon" in Madrid. The traveler had provided information on several of these, and had analyzed cells from some exposed or purportedly exposed individuals. The members of the biological dosimetry group were referred to individuals at REACTS at Oak Ridge Associated Universities for advice on follow-up treatment.

There has been an increasing interest in Spain over the past two years in biological dosimetry, a technique whereby radiation dose to individuals exposed accidentally or medically can be estimated from biological end-points (generally mutations or chromosomal alterations). This enhanced interest has been largely due to an increased use of radiation sources for industrial and medical uses. Along with this there has been an increase in the number of overexposures and a general concern of the effects of medical exposures, especially to fetuses. With this in mind it was determined that it was important to organize a conference that provided information on the current status of biological dosimetry, and the mechanistic concepts underlying the techniques, to an audience composed of biologists, physicists, health physicists, radiotherapists, and radiologists. Such an audience would include those persons most likely to encounter cases of radiation overexposure and routine medical exposure. In fact, 150 persons attended the conference, largely from Spain, and the participants were drawn from an even wider set of backgrounds than anticipated. This led to a most varied collection of questions and a very lively and productive discussion period that closed the conference. The traveler participated in this discussion period and fielded a number of intriguing and provocative questions.

The traveler had the somewhat daunting task of presenting the introductory lecture on the mechanism of induction of chromosome aberrations by ionizing radiations and how this impacts on the interpretation of data obtained from exposed individuals. In particular, he discussed the interpretation of dose-response curves that are the calibration curves for estimating dose, the likelihood of individual variation in response to radiation, and the interpretation of response to low dose/low dose rate exposures in comparison to high dose/high dose rate exposures. A new concept was presented whereby the linear/quadratic dose response curve for chromosome aberrations induced by acute X ray exposures can be considered as being the consequence of two separate components. The linear component is presumed to be due to the misrepair of radiation-induced double-strand breaks, whereas the dose-squared component is due to the misrepair of induced base damages. In this same

context chromosome aberrations induced by high LET radiation are produced by the misrepair of double-strand breaks, the major component of high LET-induced DNA damage, but a more minor component of low LET-induced DNA damage. This hypothesis is very important for interpreting and predicting values of Relative Biological Effectiveness. In addition, it has been shown in the traveler's laboratory at Oak Ridge that at low dose rates of X rays the induced aberrations are the result of the misrepair of double-strand breaks. Supporting evidence was presented, and how this model allows for an interpretation of individual variation in response to radiation was discussed. In fact, it is predicted that such variation will be insignificant with high LET radiations and low dose rate, low LET radiations, but would be predicted to be important with high dose rate, low LET radiations. This latter scenario is the one pertaining in many industrial overexposures. It was further emphasized that an accurate assessment of dose is less necessary for subsequent medical treatment, but of more significance in law suits. This is an important consideration, and requires further discussion.

It appeared from questions and comments following the traveler's talk that it had created quite a bit of interest, and provided a useful framework for the rest of the meeting.

Drs. Lloyd and Edwards from the National Radiological Protection Board, England, presented talks of a very practical nature on how to conduct the cytogenetic analysis for biological dosimetry, the construction of calibration curves, and the underlying statistical analysis. Since this group has as much experience as any other in the world, they could provide the most comprehensive review of a "how-to" type.

Dr. Bauchinger from GSF, Munich, Germany, presented a discussion of the utility of the micronucleus assay for biological dosimetry. The analysis of micronuclei is simpler and quicker than that of chromosome aberrations, and so potentially has great appeal for dosimetry purposes. It is also more amenable to automation.

However, at this time there are complications such as quite considerable variation in background frequency among individuals, and a large variation in individual response to radiation. It will be necessary to determine the sources of variation before the technique is appropriate for biological dosimetry.

One additional presentation that generated much interest was that of Dr. Garcia Sagredo who described his current approaches to automating the analysis of chromosome aberrations. Such analysis is feasible but very costly, thereby being of rather limited potential at this time. However, it is clear that in the next 10 years automated analysis will become the approach of choice.

The conference provided the opportunity for the traveler to find out the current status of biological dosimetry from interactions with colleagues from other countries. It also provided the chance to present a novel hypothesis on the mechanism of induction of chromosome alterations by ionizing radiations, that impacts considerably on the interpretation of data obtained in aberration studies and human exposure scenarios.

The traveler also had the opportunity to visit the Radiopathology and Radiotherapy Department of the Hospital General "Gregorio Maranon" to discuss several recent cases of accidental radiation overexposures. It is quite remarkable that this hospital has already assessed 21 such cases in about 1 year - this is a very high number, and might represent only a fraction of the actual number of accidental exposures. One particular case was reviewed quite extensively, since the individual involved was available for discussion. The traveler had already analyzed cells from this individual, and together with the Hospital General and Dr. Littlefield at ORAU, had estimated a whole-body exposure of 1.26 Gy. The scenario of the accident was recreated by the exposed individual in order to determine if the estimated dose was reasonable: it appears that it was. It was recommended that the Hospital General "Gregorio Maranon" medical staff contact Dr. Ricks and Dr. Fry at ORAU for additional advice

on follow-up treatment because of their considerable experience with such cases. This has been done, and contact has been established.

It is clearly important that expertise such as that developed by the traveler at Oak Ridge be shared with laboratories beginning to establish biological dosimetry programs. Since the Hospital General "Gregorio Maranon" will soon be the centre for referral of overexposure cases throughout Spain, it was especially important to initiate interaction with their key personnel. It will be particularly important to identify approaches for reducing the number of accidental exposures and for reducing the magnitude of dose from routine medical procedures. While the traveler cannot do this because of lack of specific expertise, he can provide the appropriate contacts.

The trip was both a valuable and rewarding expertise, that hopefully has helped establish a more reliable biological dosimetry program in Spain.

APPENDIX

Itinerary

November 25-29, 1990	Travel from Oak Ridge, Tennessee, to Madrid, Spain, via London, including vacation
November 30-December 2, 1990	1st International Conference on Biological Dosimetry
December 3, 1990	Visit to Hospital General "Gregorio Maranon," Radiopathology and Radiotherapy Department
December 4, 1990	Travel from Madrid, Spain, to Oak Ridge, Tennessee

Persons Contacted to a Significant Extent

Dr. Maria Orera Clemente
Dr. Marina Gomez Espi
Dr. Rafael Herranz Crespo
Hospital General "Gregorio Maranon" Madrid, Spain

Dr. David Lloyd
Dr. Alan Edwards
National Radiological Protection Board, Chilton, Oxford, England

Dr. Manfred Bauchinger
GSF, Munich, Germany

Other Persons Contacted

Members of the Scientific Committee of the Conference

Literature Acquired

Proceedings of the 1st International Conference on Biological Dosimetry - list of speakers and titles of talks attached.

Comité Científico

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JUEVES 29 DE NOVIEMBRE

17,00 a 20,00 h.: Recogida de documentación.
Sede de la Reunión.

VIERNES 30 DE NOVIEMBRE

8,00 a 9,30 h.: Recogida de documentación.
9,30 h.: Inauguración.
10,00 h.: I SESION
Presidente: Dr. D. JOSÉ LUIS BUTRAGUEÑO CASADO
Moderadora: Dra. D.ª MARÍA ORERA CLEMENTE
Conferencia: **Biological Dosimetry: Mechanistic Concepts**
Prof. Dr. R. JULIAN PRESTON
(ORNL, Oak Ridge. Tennessee, EE.UU.)
Coloquio.
11,30 h.: PAUSA: Café de trabajo.
12,00 h.: II SESION
Presidente: Dr. D. GABRIEL MAGANTO FERNÁNDEZ
Moderadora: Dra. D.ª ANA GONZÁLEZ CALVO
1.ª Ponencia: **Servicios de dosimetría personal**
Dr. D. GUSTAVO LÓPEZ ORTIZ
2.ª Ponencia: **Consideraciones sobre mutagénesis**
Dr. D. V. J. GOYANES VILLAESCUSA
Dr. D. JOSÉ LUIS FERNÁNDEZ GARCÍA
Coloquio.

15.30 h.: III SESION
Presidente: Dr. D. ENRIQUE MALBOYSSON
Moderadora: Dra. D.ª AURORA BILBAO SOTO
Conferencia: **Biological dosimetry by cytogenetic methods**
Prof. Dr. R. DAVID LLOYD
(NRPB. Oxford, U.K.)
Coloquio.
17.00 h.: Exposición de posters. Café de trabajo.
17,30 h.: IV SESION
Presidente: Dr. Prof. D. JOSÉ LUIS CARRERAS DELGADO
Moderador: Dr. D. PERE CARBONELL MITJÁNS
Conferencia: **Dosimetric and statistical aspects of cytogenetics**
Dr. ALAN A. EDWARDS (NRPB. Oxford, U.K.)
Coloquio.

SABADO 1 DE DICIEMBRE

9,00 h.: V SESION
Presidente: Dr. D. VÍCTOR CONDE RODELGO
Moderador: Dr. D. JACINTO NAVLET ARMENTA
Conferencia: **Radiation-induced micronuclei in human lymphocytes: An alternative assay to chromosome analysis to quantify low dose exposures**
Prof. Dr. MANFRED BAUCHINGER
(GSF. München, Deutschland)
Coloquio.

10.30 h.: Sesión de posters. Café de trabajo.
11.00 h.: VI SESION
Presidente: Dr. D. BENJAMÍN SÁNCHEZ F. MURIAS
Moderadora: Dra. D.ª MARINA GÓMEZ ESPÍ
3.ª Ponencia: **Diagnóstico prenatal y radiación**
Dr. D. JOAQUÍN DÍAZ RECASÉNS
4.ª Ponencia: **Automatización en dosimetría biológica**
Dr. D. JOSÉ M. GARCÍA SAGREDO
12,30 h.: MESA REDONDA
Moderador: Dr. D. RAFAEL HERRANZ CRESPO
Secretaria: Dra. D.ª MARÍA ORERA CLEMENTE
Participantes: Prof. Dr. R.J. PRESTON
Prof. Dr. D. LLOYD
Prof. Dr. M. BAUCHINGER
Dr. A.A. EDWARDS
Dr. D. G. LÓPEZ ORTIZ
Dr. D. V.J. GOYANES VILLAESCUSA
Dr. D. J. DÍAZ RECASÉNS
Dr. D. J.M. GARCÍA SAGREDO
CLAUSURA

Idiomas oficiales: Español e inglés.
Traducción simultánea.

A todos los asistentes se les entregará el correspondiente libro de conferencias y ponencias.

END

DATE FILMED

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