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ICRP - WHAT'S HAPPENING

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INTRODUCTION

First, as President of the United States Health Physics Society, I must convey the best wishes of that Society for a stimulating and productive Symposium. Second, let me say how honored I am to be asked to represent the ICRP. I must immediately add, of course, that no one person speaks for the Commission and I am only going to give you my personal thoughts about the ICRP in the 1980's.

It is my intention to remind you of the work currently in progress, to reiterate the stated objectives of the Commission for the mid 80's and to peruse a few "radical" ideas which might conceivably be extensions of the principles introduced in Publication 26.

In much the same way that most of the world has divided history into the periods before and after the death of Christ, much of the radiation protection community has divided radiation protection into two periods - one before Publication 26 and one after, i.e., this is now the year of ICRP 26 "05". Perhaps a more appropriate simile would be the emergence from the dark ages, since this might be considered the first truly scientific and coherent basis for setting standards since the erythema standard of the 1920's. However we characterize it, the process of setting radiation protection standards has been inalterably changed in such a way that subjective, albeit thoughtful, opinion will no longer be adequate justification for the selection of dose limits.

1. Present Activities

Not withstanding all these platitudes, much of the work of the Commission and its committees since 1977 has been to complete

and expand the work initiated in Publication 26. The Herculean task of developing the new guidance for internal emitters is the outstanding example. Dr. Vennart and his committee (Committee 2 on Secondary Standards) have provided not only the Annual Limits of Intake (ALI's) and the Derived Air Concentrations (DAC's) but the entire basis for each decision - metabolic models, dosimetric models and physical data, all of which will be published.

A second effort of extreme importance is the definite work being done in Committee 4 on cost-benefit analysis in the optimization of radiation protection. The document which was developed by a task group under Dr. Gonzalez is in final revision with the hope that it can be approved some time this calendar year. Until these two important pieces of work are completed, published and disseminated, the concepts embodied in the effective dose equivalent and optimization of protection will remain somewhat abstract and theoretical.

Publication 30, "Limits for Intakes of Radionuclides by Workers," has already done much to take the mystery out of the approach recommended for combining internal and external exposure. Once Committee 4's task group under Dr. Kunz completes it's revision of Publication 10, "Evaluation of Radiation Doses to Body Tissues from Internal Contamination Due to Occupational Exposure," perhaps the difficulties of applying the committed effective dose equivalent for the long-lived alpha emitters will be resolved to everyones satisfaction! (Nearly everyones). Committee 2 is also in the process of reviewing the practicality of assigning adjustment factors for use in applying the occupational ALI's to members of the public. A factor of 1/10 for adults (1/50 if the exposure were thought likely to be continued over long periods) and a factor 1/100 for children, with appropriate guidance for their respective applications, is under consideration by Committee 2. The Committee will also discuss effects of the possibly overcautious nature of the 1/100 factor on cost-benefit analyses which require more realistic assessments.

Two important areas of discussion regarding the "Optimization" document have been resolved. The first is semantic in nature. The Commission has determined that for its use "as low as reasonably achievable, social and economic consideration being taken into account," is the formal expression of the shorthand "Optimization of Protection".

The following paragraph or something very close to it will appear in the document on cost-benefit analysis in the Optimization of Radiation Protection:

> "In this report, which is concerned primarily with the second of these components, the optimization of radiation protection, includes a wide range of techniques, some drawn from operational research and some from economics. These techniques include, but are not confined to, the procedures of cost-benefit analysis and it is these procedures that are discussed in detail in this report. It is important to recognize that other techniques, some quantitative, some more qualitative, may also be used in the optimization of protection."

The second major issue revolves around the nature of alpha in the expression: cost of detriment = αs. α is of course, the monetary value of the mansievert. The purists among us insist that, since we are assuming a linear relationshop between dose and probability of effect, α is by definition a constant. Others argue that the social or regulatory pressure would increase the value of α as the dose increases. This has been resolved for the case in which one would want to relate the detriment to the distribution of indiviual doses by adding another term to the above equation. It might then have the form $y = \alpha s + \beta \Sigma N_j f(H_j)$ in which β is a constant and H_j is the mean dose equivalent to the N_j individual in the j^{th} group. We only need to debate now the appropriateness of including a term in the cost-benefit analysis.

In addition to these two specific areas, nearly all the Commission's publications require revision. It is in the process of reviewing these revisions that the members of the Committees and the Commission begin to sort out the precise meaning of the basic recommendations contained in Publication 26. In addition to the work of Committee 2 on internal emitters (and Committee 4) and the Optimization Report of Committee 4 the following work is either recently completed or is currently underway.

1.1 Revision of Publications 15 and 21, "Protection Against Ionizing Radiation from External Sources"

The revisions of Publication 15 together with the medical related portion of Publication 21 have been adopted with a new title, ICRP Publication 33, "Radiation Protection in Medicine". As this title suggests, it now deals only with medical sources.

The questions of justification in relation to patient exposure came under careful review during both preparation by Committee 3 and approval by the Main Commission. Paragraphs 32 and 34 from Publication 33, which follow, suggest that a quantitative approach is not apparent at this time and for all diagnostic tests.

(32) "The professional judgment of the referring physician and radiologist, singly or jointly, that a proposed medical radiological procedure may be of benefit to the recipient patient will normally constitute "justification" vis-a-vis the individual patient's exposure. Retrospective analysis of the correctness of these decisions (efficacy) will refine the indications and non-indications for future patients for whom a given procedure may be considered as useful. This is discussed in detail in the forthcoming ICRP "Protection of the Patient in X-Ray diagnosis."

(34) "The choice, and in some cases the order of radiological examinatins and the alternative choices of non-radiological examinations or of foregoing any examinations other than simple clinical examination should be based on a judgement of the relative benefits, risks and costs of the available choices. In this context, the benefits are influenced by the diagnostic efficacy of the various procedures and on the desirability of employing invasive rather than noninvasive procedures and it should be remenbered that both positive and negative findings may be of benefit to the patient".

The question of cost-benefit analysis in the optimization of protection for medical installations and equipment came under similar discussion particularly within Committee 3 where it was concluded in Paragraph 44 that:

(44) "Optimization should be exercised in planning new installations both with regard to the protective barriers and the design of protective devices in equipment. However, the case-by-case optimization of widely-used equipment is not appropriate

because it would nullify the advantages of standardization and would cause a net social loss. Optimization should, however, play a part in the setting of such standards and specifications on their subsequent applications. For the practical application of this, the reader is referred to the forthcoming ICRP report on "Optimization".

1.2 Publication 12, "General Principles of Monitoring for Radiation Protection of Workers"

This was an interesting example of the task group trying simply to update Publication 12 but finding that the criteria needed to address the requirements for monitoring included low doses for the purposes of determining dose distributions so optimization exercises can be employed. The early drafts had addressed the monitoring needs in relation to the dose limits as was done in the past. This task group, under the chairmanship of B. C. Winckler, is the responsibility of Committee 4. It is expected that this revision will be adopted by the Commission in 1982.

1.3 Publication 13, "Radiation Protection in Schools"

This has been revised and it is expected that it will be adopted in 1982. The present draft, which has been prepared by M. O'Riordan, meets the intent of the Commission that this document be of use to the practicing teacher as well as to the national authorities. It is not a primer on Publication 26!

1.4 Publication 16, "Protection of the Patient in X-Ray Diagnosis"

As a Commission of the International Society of Radiology, the ICRP has traditionally felt a specific responsibility to the medical community. As a result of this relationship, Committee 3 has under revision or in preparation several documents dealing with protection of the patient. Unlike the normal ICRP publications, which are intended for national authorities, these publications are intended for the individual practitioner.

The revision of Publication 16 is in the final editorial stages and should be adopted by the Commission in 1982. The new data on mental retardation from Committee 1 is of particular

interest. R. Mole and W. Schull have shown strong evidence that the fetus is particularly sensitive during the 10th through 17th week such that severe mental retardation can be induced during this period. Appropriate guidance has been included in the revision.

1.5 Publication 17, "Protection of the Patient in Radionuclide Investigation"

Committee 2 has a task group under Dr. Nusslin on the dose to patients from radiopharmaceuticals. This data will be of use in the pharmaceutical industries and research establishments as well as in the clinical situation. Committee 2 will then produce a stand-alone document on doses to patients for $\sim$150 radionuclides.

Committee 3 has a task group under Dr. Saenger which is preparing a document, "The Protection of the Patient in Nuclear Medicine". (This is expected to be an analog of Protection of the Patient in X-Ray Diagnosis.) The Committee 2 effort should be complete in 1983 and the Committee 3 effort in late 1983 or 1984.

1.6 Publication 21, "Data for Protection Against Ionizing Radiation from External Sources - Supplement to ICRP 15"

The revision of Publication 15 (Publication 33) contains the data from Publication 21 which dealt with medical sources, i.e., output data for x-ray machines and sealed sources and transmission curves for various x-ray, γ-ray and neutron shields. Several examples are given on ways to use cost benefit analysis in the design of medical x-ray suites.

The new version of Publication 21 has been characterized as the external radiation analog of Publication 30. The task group under Dr. Thomas will be examining relationships between fluence and dose, the dose equivalent, and perhaps "the effective dose equivalent" for a variety of radiation types and energies. An in-depth analysis of the usefulness and appropriateness of the absorbed dose and dose equivalent index quantities is underway in a task group of the ICRU entitled, "The Practical Determination of Dose Equivalent". The results of the ICRU task group will of course be critical in determining the ICRP treatment of the index quantity.

1.7 Publication 7, "Principles of Enviromental Monitoring Related to the Handling of Radioactive Materials"

Although the Commission has suggested a simple revision, Committee 4 felt that the publication needed fundamental reshaping. As a result, the Commission appointed a new task group under Dr. Webb to revise Publication 7.

1.8 Publication 27, "Problems Involved in Developing and Index of Harm"

Sir Edward Pochin has been given responsibility to extend the Index of Harm work. In particular he will include a more detailed consideration of non-stochastic effects, hereditary detriment and on fatal cancer. It would be extremely useful to know the distribution of accidental death within a given "safe" industry, i.e., does the average worker in the communication industry have an acceptable risk 10 times smaller than say the tower lineman?

In addition to the work described above there are several new task group efforts which had no roots in previous publications.

1.9 Task Group on Natural Radiation Exposure

The Chairman of the Commission has one of the most difficult problems in this area. In Professor Lindell's home country of Sweden, the average effective dose equivalent from radon in homes is 3.5 mSv/yr with one hundred thousand apartments having 20 mSv/yr. ICRP is expected to give some guidance, but clearly a dose limit as such can have no meaning. This is a bold and difficult venture for the Commission.

1.10 Task Group on Radon and the Public

As the obvious sequel to both the report on "Occupational Limits for Inhalation of ^{222}Rn, ^{220}Rn and their Short-Lived Daughters" and the task group effort on the "Natural Radiation Exposure", Dr. Jacobi is chairing an effort to provide guidance on radon ALI's for the public. The applicability of the lung cancer data among miners was difficult enough for occupational limits but is even more tenuous for application to limits for members of the public.

1.11 Task Group on Protection of the Patient in Radiotherapy

As part of Committee 3, "Protection of the Patient" series, a task group has been formed under Dr. Sheline to prepare a report on this important topic. A strong, tight outline and Dr. Sheline's concerns portend that we may be on the right track this time. Keeping the dose as low as reasonably achievable may give the wrong message in this case.

1.12 Task Group on Protection of the Patient in the Event of Radiation Accidents

Committee 4 and its working group have been struggling to get a satisfactory outline for this work - one that sets the basis for: intervention levels, criteria for return to contaminated areas criteria, and countermeasures (among other topics); and still avoids the trap of telling national authorites specifically what they are to do.

2. The Mission for the First Half of the 80's

Up to this point we have been tying together all the loose ends, set loose as it were by the issuance of Publication 26. However, the Commission sees a broader mission for itself. It is during the present four year period (a Commission's life is four years) that the basic information which will be needed for the next revision of the basic standards must be gathered. It is quite prudently assumed that the drafting work on a new set of recommendations will take place in the last half of the 1980's.

The emphasis must then shift to Committees 1 and 2. Committee 1 has many virtual phethora) working groups, including a major effort under Dr. Upton on non-stochastic effects and a working group on Risk to the Embryo or Foetus under Dr. Mole. The quantifications of detriment is under intensive study. Essentially the Committee is trying to respond to the practical need of assessing the different types of deleterious effects on a common basis. Another working group composed of Committee 1 geneticists will look into quantifying detriment for genetic disease. They will seek help from clinical geneticists in this work.

2.1 Joint Task Group on ICRU and ICRP

This task group was organized to consider basic radiation protection quantities such as the problems posed by the equation H = DQN with particular emphasis on Q. The relationship between Q and RBE is under review. Certainly these are topics for this preparatory period in the Commission schedule.

3. Perhaps a Few Radical Thoughts

H. H. Rossi[1] has suggested for some time that local energy density correlates better with RBE that does LET. Clearly LET is a simplification and indeed may be a simplification which tends to hide the basic information. Bond[2] has suggested that we employ a system without Q, one in which we simply adopt a risk-per-rad figure for each radiation type and energy group and (in theory at least) a risk per Becquerel for each radionuclide. Actually, one can find this approach in the recently adopted ICRP Publication on Occupational Limits for Inhalation of ^{222}Rn, ^{220}Rn and their short-lived daughters. In that document, one of the approaches was to derive risk factors per Working Level Month (WLM) from the epidemiology studies on miners. Using the risk associated with 5 rem per year as a given in ICRP Publication 26, it was possible to deduce the appropriate WLM from the epidemiology studies - no Q was needed.

Until we lost our confidence in the Japanese dosimetry, we had a neutron risk-per-rad relationship on which most could agree. Simply adopting that neutron absorbed dose which resulted in a risk of 1.65×10^{-6}/Sv/yr would suffice - no Q needed. Of course, since we don't have the whole range of risk-per-sievert or risk-per-Becquerel relationships we aren't quite ready, but it is surely worth thinking about.

At the 1981 meeting of the NCRP (U.S.), V. P. Bond demonstrated that the knowledge of the interaction of the secondary charged particles with biological structures may have more relevance for predicting stochastic effects than does the classical concept of absorbed dose.

So much for Q, H and D, - what's left? - the limit! Perhaps it is time to consider not having upper limits; surely they are less important in Publication 26 than they were in Publication

9. Once we can characterize detriment in a manner that is accepted and understood by all, we need simply assume: (1) that the protection has been optimized and (2) that the individual worker and this supervisor understand the risk.

This would of course be analogous to the situation which exists in other work situations. If a worker wants to assume high risks, i.e., steel work, deep-sea fishing, etc., he is permitted to do so. If he chooses not to, he elects a lower risk occupation.

Perhaps a worker might choose to stay below 10 mSv/yr. It would exclude him from certain jobs; on the other hand, there may be an individual who easily accepts a risk 10 or even 100 times greater. Such an approach would not be satisfactory for members of the public.

4. CONCLUSION

In conclusion I would like to point out that this simple description of work in progress only hints at the dynamic interactions of the scientists who comprise the Commission, its four committies and their dozen or so task groups. It is only through the talents and hard work of these men and women that the ICRP is able to serve the radiation protection community.

REFERENCES

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