GT-114-70 (Index)

A PROPOSAL FOR AT LEAST A TEN-FOLD REDUCTION IN THE FRC GUIDELINES FOR RADIATION EXPOSURE TO THE POPULATION-AT-LARGE

SUPPORTIVE EVIDENCE

by

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SUMMARY TESTIMONY

On October 29, 1969 my colleague, Dr. Arthur Tamplin, and I presented, at a scientific meeting of the Institute for Electrical and Electronic Engineers an estimate that exposure of the U.S. population to F.R.C. Guidelines of 0.17 Rads per year would lead to 16,000 extra cases of cancer annually in the U.S.A. Today, the only way in which we might change that number is to increase it materially, since abundant evidence we have recently uncovered indicates very strongly that the true situation is even worse.

As a result of our scientific presentation, followed by testimony before the Senate Subcommittee on Air and Water Pollution, we have been attacked as "unfriendly to atomic energy". I have been with atomic energy work since long before an Atomic Energy Commission existed, and what is more my contributions in this field with respect to the National Defense are quite clear from the record. I share with this Committee the desire to use atomic energy in any way possible to raise the standard of living of the people of the U.S.A., to achieve any of its benefits - provided we know the risks and make a full disclosure to the public of the true magnitude of the risks. Where controversy or uncertainty exists, we must state publicly the range of our uncertainty. The most potent enemy of atomic energy development is <u>not</u> truth, but is false optimism and an ostrich-like approach of refusal to examine the possible risks in a reasonable fashion. The history of the Joint Committee on Atomic Energy has been to achieve the fullest statement of truth in the radiation exposure problem. And that is why the published Hearings of this Committee represent <u>the</u> major Scientific Forum for presentation of the issues.

My colleague, Dr. Arthur Tamplin, and I have prepared 9 scientific documents for this Hearing, and you have them before you. We have addressed several of the crucial issues in great detail in these documents. We believe we have

several major new developments to report to you in these documents, including perhaps some major new scientific contributions of consequence to medicine and to solving the radiation - risk problem with an accelerated pace not previously thought possible. I shall highlight the subjects covered in these documents; detailed study must be at your leisure.

I. The Question of Safe Radiation Thresholds for Human Exposure

The Document (No. 3) entitled "Studies of Radium-Exposed Humans II" presents our detailed refutation of Professor Robley Evans latest claims that a threshold exists. While this claim has been clearly refuted in your previous Hearings, an A.E.C. Staff Document still claims it. The I.C.R.P., Parker, Archer, Morgan, and Snyder all reject the Evans' claims. We have presented in this document detailed analysis of why we do too.

Moreover, in your excellent Hearings on the Uranium Miners, Dr. Evans answered Congressman Hosmer as follows:

(Quote) "I am perfectly glad to turn the statement around the other way. I believe, in a positive sense, that 1-to-3 working levels and a total accumulation of 300 to 400 working level months is innocuous to man".

As you will see from our Document (No. 4) on Uranium Miners, based upon evidence available at the time of your Hearings, we show clearly that a great deal of cancer would have been expected at 300-400 WLM.

And now, some two years later, an abundant excess of lung cancer has occurred and been reported by Lundin and Archer in the region of 120 to 360 WLM. In fact, a four fold increase in lung cancer is reported. So the threshold concept of Evans predicted safety where in fact a disaster occurred.

Indeed, when anyone involved in setting standards even asks the question of possible safe threshold values, he is courting disaster, for safe thresholds can't, in general, be proved. Assuming they exist leads to the fiasco I just described for the Uranium Miners.

And of the greatest importance, Dr. Stewart in England has just published evidence of a dose-response relationship in the region of 1-5Rads.

II. The Uranium Miner Story

In the document before you (No. 4) we have proved the fallacy of the doctrine of a "special" form of lung cancer being induced by radiation. We have demonstrated that two kinds of lung cancer are clearly induced by radon daughters.

Further, we have provided you with evidence in this document that even the new Uranium Miner Guidelines can lead to serious trouble because of the nature of the problem of exposure (Fully detailed in the document No. 4).

Because of the failure of others to see the two forms of lung cancer induced in the miners, they have falsely cast doubt on lung cancer being radiation induced in Hiroshima-Nagasaki.

III. The Breast Cancer Story

In Document No. 6 we demonstrate to you that breast cancer is clearly induced by radiation in A-bomb survivors as it is clearly proven by Mackenzie to be induced by fluoroscopic radiation in tuberculosis patients in Nova Scotia, Canada. The results are in excellent harmony, and, discouragingly, both studies point to 50 Rads or less being enough to double the incidence of breast cancer in two areas, under vastly different circumstances, 7500 miles apart.

IV. The Lung Cancer Story

In Document No. 7 we have reviewed the Hiroshima-Nagasaki Lung Cancer data, previously called into question by Miller and by Storer on grounds we showed in our Uranium Miner paper to be indefensible. The Japanese data are sound and they agree with the Court Brown-Doll British data. The doubling dose is estimated, on careful analysis, to be under 100 Rads for lung cancer in man.

Now, we would like to present to you some major new developments of scientific importance, of human importance, and of importance in grossly simplifying the

acquisition of knowledge concerning human carcinogenesis by radiation - more than 100 times as easily as in Hiroshima-Nagasaki. These are also in Document 7. The story is as follows:

1. Steinitz, in a beautifully-executed epidemiological study in Israel proved conclusively that lung cancer is 5-10 times as frequent in people previously treated for tuberculosis. She suspected the tuberculosis itself increases the risk of later lung cancer. The increase itself is enormous - as large as the excess risk of lung cancer in cigarette smokers. We do <u>not</u> think tuberculosis, itself, causes this lung cancer.

Rather, we announce to you our hypothesis as follows:

The excessive (5-10 fold) lung cancer in pulmonary tuberculosis cases is due to fluoroscopic radiation associated primarily with pneumothorax treatment in the past, and we suggest

(a) Immediate world-wide examination of records of tuberculosis patients, including the number of fluoroscopies they received, for their subsequent occurrence or non-occurrence of pulmonary cancer.

(b) Based upon our analysis of Mackenzie's breast cancer study, we predict the average patient in hospitals where treatment was similar to Nova Scotia must have received about 450 Rads of radiation, and this should lead right to the 5-10 fold increase in lung cancer observed by Steinitz. We are confident the study of records of tuberculosis hospitals will confirm all our predictions.

(c) Since millions of people, world-wide, were treated for tuberculosis in 1930-1950, the latent period for lung cancer or breast cancer development is over. There need be no waiting; if the

epidemiologic studies are started now, we should have answers pouring in from all over the world in less than a year. And the cases available should be 100 times the extremely valuable Hiroshima-Nagasaki studies. By ranking patients by number of fluoroscopies, we may also very well be able to have the entire dose-response curve over a wide range of radiation doses.

We urge immediate initiation of these studies by National Cancer Institute, U.S. Public Health Service, and by other countries. We predict that within one year few people will still be debating whether radiation causes lung cancer, breast cancer, and other cancers in the fluoroscopic beam.

(d) If we are right, this may be of the greatest importance in future reduction of cancer in tuberculous persons. New techniques of fluoroscopy can and should be used to reduce dosage, and thereby reduce the risk of lung cancer.

V. Lack of Protection by Slow Delivery (Fractionation) of Dosage

Many people, ourselves included, have hoped that slow delivery of radiation, so-called fractionation of dose, will operate to reduce the risk of future cancer. In Document 1A we have presented for you our analysis which indicates, we believe, very strongly that this is simply an illusion, and any idea that the animal experiments in this regard prove "repair" of carcinogenic damage has no foundation whatever. The illusion of protection by fractionation arises from experiments where the acute dose is delivered at an earlier period of life, when sensitivity to radiation is, in general, high whereas the protracted dose is continued into a later period of life when sensitivity is lower.

So, instead of proving anything at all that should lead us to be hopeful that slow delivery of radiation lessens the risk of cancer, this study indicates radiation, delivered slow or fast, produces just what is expected from the age at which radiation occurs. Further, this study should make us especially wary of irradiating children.

We are, therefore, extremely pessimistic that there remains much hope for protection from low dose rate.

Additionally these studies enable us to understand why alpha particles, neutrons, or other so-called high LET radiation are more effective in carcinogenesis than x-rays, γ rays, or β -particles.

VI. Direct Proof of the Validity of the Doubling-Dose Concept

An I.C.R.P. Task Force, with the A.E.C. Staff following close behind, has essentially ridiculed the idea that the doubling dose concept could operate for two groups who differ widely in their expected cancer rate without radiation. In essence what they say is that if one population of individuals has a cancer rate of 70 per million and another population a rate of 700 per million, they can't believe a doubling dose, say 100 Rads, could produce 70 extra cases in the first group and 700 in the second group. They suggest that if 70 extra cases are produced in one population, 70, not 700 will be found in the second population.

Two recent publications, with direct evidence, prove the doubling dose concept to be in harmony with observations, while the I.C.R.P. Task Force suggestion leads to incorrect answers. The first study, in Document No. 9, by Lundin, Archer and co-workers is on radiation (from radon daughters) in cigarette smokers and non-smokers. Without radiation, the cigarette smokers have 10 times the lung cancer incidence of the non-smokers. When they receive radiation to the same degree, in direct contradiction of I.C.R.P. Task Force and A.E.C. staff, the cigarette smokers get 10 times as much cancer from the same radiation dose than do the non-smokers. Further in an entirely analogous study with asbestos (instead of radiation) plus cigarette smoking, the same asbestos exposure produces much more lung cancer in cigarette smokers than in non-smokers.

The doubling-dose concept is sound!

VII. The I.C.R.P. Estimates and the Gofman-Tamplin Estimates

Subsequent to our testimony before the Senate Sub-Committee on Air and Water Pollution we have obtained a copy of I.C.R.P. Publication 14. We have reviewed this document and compared it with our testimony. We find that there is substantial agreement between I.C.R.P. Publication 14 and our testimony (See Document No. 8). I.C.R.P. has now drastically increased its estimate of cancers of diverse organs induced by radiation. Now there is essential harmony between our previous estimates of expected cases of cancers from F.R.C. Guideline exposure and those which would be calculated from I.C.R.P. 14. The one remaining major difference resulted from an oversight on the part of the authors of I.C.R.P. Publication 14. Nevertheless, in spite of their oversight, they concur with us and indicate that the data suggest that the 0.170 rem/year guideline should be reduced by at least a factor of ten.

Thus, the International Commission on Radiological Protection is now in harmony with our estimates of the cancer risk from radiation.

VIII. Radiation-Induction of Cancer in Experimental Animals

An A.E.C. Staff Document makes the following remarkably unbelievable statement,

"The majority of radiation-associated carcinogenesis data indicate a relation between dose and cancer which shows less and possibly no effect at low doses compared to high doses. These data come from chromosome and animal studies not cited by Gofman and Tamplin".

In Document No. 10 before you, we have presented an analysis of the beautiful and exhaustive experiments of Bond and co-workers on radiation-induction of breast cancer in rats. These studies represent a bulwark of support for the linear hypothesis of radiation induction of cancer, and they point strongly against any suggestion of a safe radiation threshold. We concur with

Bond and co-workers, and further an analysis of their data indicates an extremely low doubling dose for breast cancer induction in the rat, between 5 and 20 rads! These experimental animal data are in close harmony with our calculations (Document No. 6) for human breast cancer.

It is incredible to us that the A.E.C. Staff issues a statement diametrically opposed to the results of one of the finest experiments ever supported by the Division of Biology and Medicine of the A.E.C.

The other part of the A.E.C. Staff statement deals with radiation effects upon chromosomes. Since the field of low dose radiation, chromosomes, and cancer happens to have been my major personal research field for over four years, I feel especially qualified to speak on this subject.

I can say unequivocally, and without fear of contradiction, that there is not one shred of scientific evidence linking the type of chromosome alterations referred to by the A.E.C. with the development of cancer. Moreover, my colleagues and I have presented the evidence concerning which chromosome changes are related to cancer in three separate meetings and in documents to the A.E.C. I shall be pleased to provide these documents to this Committee as a supplement if you desire them. Perhaps the A.E.C. Staff does not take our work seriously. I might point out that by unanimous vote of the Program Committee, my colleagues and I have been invited to present an invitational lecture on "Chromosomes and Cancer" at the forthcoming 10th International Cancer Congress in Houston, Texas in May, 1970. And this invitation came long before we had said anything about radiation standards.

TABLE OF SUBMITTED DOCUMENTS

I. Summary Testimony (Detailed presentation listed below)(GT-114-70).

II. Document No. 3. "Studies of Radium-Exposed Humans II: Further Refutation of the R D. Evans' Claim That "The Linear Non-Threshold Model of Radiation Carcinogenesis is Incorrect"
by J. W. Gofman and A. R. Tamplin (GT-105-69).

III. Document No. 4. "The Colorado Plateau: Joachimsthal Revisited?: An Analysis of the Lung Cancer Problem in Uranium and Hardrock Miners"
by A. R. Tamplin and J. W. Gofman (GT-106-70).

IV. Document No. 6. "Radiation Induction of Breast Cancer"
by A. R. Tamplin and J. W. Gofman (GT-107-70).

V. Document No. 7. "Radiation Induction of Human Lung Cancer"
by J. W. Gofman and A. R. Tamplin (GT-108-70).

VI. Document No. 1-A. "The Mechanism of Radiation Carcinogenesis"
by J. W. Gofman and A. R. Tamplin (GT-109-70).

VII. Document No. 8. "ICRP-Publication 14 vs The Gofman-Tamplin Report"
by A. R. Tamplin and J. W. Gofman (GT-110-70).

VIII. Document No. 9. "Major Fallacies in the A.E.C. Staff Comments on the Gofman-Tamplin Papers and Congressional Testimony I. The Demonstrated Validity of the Doubling Dose Concept as Used by Gofman and Tamplin"
by J. W. Gofman and A. R. Tamplin (GT-111-70).

IX. Document No. 2-A. "Radiation Induction of Breast Cancer in the Rat: A Validation of the Linear Hypothesis of Radiation Carcinogenesis over the Range 0-600 Rads"
by J. W. Gofman and A. R. Tamplin (GT-112-70).

X. Document No. 10. "Radiation Aging by High LET Radiation: The Implications of Assuming Cell Nucleus Irradiation is the Relevant Parameter"
by Donald P. Geesaman (GT-113-70).