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ALLOWABLE OCCUPATIONAL EXPOSURES AND EMPLOYEE'S COMPENSATION

by

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INTRODUCTION

In the previous reports of this series we have introduced evidence which demonstrates that a dosage of 50 rad will double the spontaneous incidence of all forms of human cancer.[1,2] In GT-110-70[3] and GT-117-70[4] we have shown that this conclusion is in substantial agreement with ICRP Publication 14.[5] The purpose of this report is to discuss the implications of this finding in terms of occupational exposure and to present some recommendations for modifying the existing exposure guidelines.

CANCER RISK AT THE WHOLE BODY OCCUPATIONAL EXPOSURE LIMIT

The present allowable whole body exposure limit is 5 rem per year. At this level a worker could achieve a dose of 50 rem in ten years. His subsequent cancer expectancy would then be twice that for non-exposed members of the population. Or put in a more meaningful way, there would be a 50-50 chance that any cancer which he develops would be a direct result of his occupational exposure. This would be a sufficient basis for compensation as a work related illness.

ALLOWABLE DOSAGE TO VARIOUS ORGANS

The allowable dosage to the various organs of the body as recommended in ICRP Publication 9[6] are:

Gonads and red bone marrow	5 rem/yr
Skin; thyroid; bone	30 rem/yr
Hands and forearms; feet and ankles	75 rem/yr
All other organs	15 rem/yr

The MPC for the various radionuclides in air and water as tabulated in 10 CFR 20[7] reflects these dosage limits. The lower dosage limit for the red bone marrow is a reflection of the concept that leukemia is the most radiogenic of human cancers. However, as we have shown in this series of reports, all forms of human cancer are induced by radiation in proportion to their spontaneous incidence. Consequently, 1 rad will induce more lung cancers than leukemias. In other words, the allowable lung dose should be lower, not higher, than the allowable red marrow dose. Moreover, since leukemia represents only 5% of human cancer, the allowable whole body dose should be 1/20 of the allowable red marrow dose. As we indicated in GT-110-70, this conclusion is supported by ICRP Publication 14.

RECOMMENDATIONS

1. Assuming that the present red marrow dose limit corresponds to an acceptable risk level, the permissible whole body dosage should be reduced to 1/20 of this value or 250 mrem/yr.

2. Assuming that the present red marrow dose limit corresponds to an acceptable risk level, the permissible level to other organs should be adjusted according to the following equation:

$$\text{Permissible Limit for Organ X} = \frac{\text{Leukemia incidence}}{\text{Cancer incidence in Organ X}} \text{ (5 rem/yr).}$$

3. When the exposure may involve more than one organ the following equation should apply:

$$\text{Permissible Limit for Organs X, Y, and Z} = \frac{\text{Leukemia incidence}}{\text{Sum of Cancer incidence in Organs X,Y and Z}} \text{ (5 rem/yr).}$$

4. Because of the proven sensitivity of the developing fetus, especially in the early phases of gestation, special dose limits should certainly be considered for women in the child-bearing age.

5. Since the number of individuals working in the nuclear industry will become much larger in the future, the allowable genetic exposure to individuals under 30 years of age should be reconsidered.

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