

RESEARCH PROGRAMS OF THE ATOMIC ENERGY COMMISSION'S DIVISION OF BIOLOGY AND MEDICINE RELEVANT TO PROBLEMS OF HEALTH AND POLLUTION

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1. Introduction

The program of the Division of Biology and Medicine has the major long term objective to measure and to evaluate the effects of radiations on man. Meeting this obligation is not a simple task. Many of the reasons for this will be obvious to you. Human experimentation is quite properly proscribed; we can make observations on man's responses to radiations only following exposure for reasons other than our need for radiobiological information, reasons such as accident, medical usage of radiations, and so on. We overcome this in part by resorting to the use of human cells in tissue culture. However, the responses of these may not give us a fair picture of what happens in a human being. Hence, we also use experimental animals and attempt to extrapolate the results of those studies to the human situation. Again, a mouse or a dog is not a man, and we need to find ways to improve confidence in our abilities to translate animal data into reliable estimates of hazards to man.

As with any presumably deleterious environmental contaminant, we have the problem of measuring dosages and of relating the magnitudes of observed effects to the dose. This involves not only measurements of external radiation, but the tracing of radionuclides through whatever environmental pathways they may follow in getting into man, determining localizations in human cells and tissues, measuring rates of turnover (biological half-life), and using this information to determine radiation dosages that can be ascribed to such internal emitters.

Except in case of accident, nuclear warfare, and so forth, the radiation doses that we are concerned with are quite small, and this leads to the problem that I do not need to detail to an audience of statisticians: when dosages are small, effects are small, hence difficult to measure because of the sheer magnitude of the observations that must be carried out to obtain samples large enough to permit establishing the statistical significance of differences that may be found. In addition, the effects produced by radiation are indistinguishable from those