III. FUTURE PERSPECTIVE

Future Perspective of Radiobiological Studies

MITOSHI AKIYAMA AND NORI NAKAMURA

Oncogenes/Somatic mutations/Selection bias/Immunology

1. Molecular approach of radiation-related cancer in human

Studies on molecular changes associated with radiation-related cancer may be required, among others, to understand the outcome of human exposure to ionizing radiation. Pathological tumor specimens may serve for this purpose using monoclonal antibodies and recombinant DNA techniques.

2. Somatic mutation studies

As demonstrated by the Chernobyl nuclear power plant accident, radiation dose estimation is quite difficult but it is necessary to identify the individual's dose assessment. Chromosome analysis in peripheral blood lymphocytes has been well established as a biological dosimeter although its application to a large cohort is both costly and time consuming. Establishment of simple assays including chromosome painting of interphase nuclei as well as somatic mutations using flow cytometry is desirable. Important lessons from our recent studies of A-bomb survivors are that, assays established in cultured cell lines are not always applicable to the in vivo situation primarily because of two factors, one is elimination of mutant cells in vivo which may be a time dependent phenomenon and the other is an age-related increase of the back ground frequency. Whether any assay may be useful or not can only be evaluated after examining individuals previously exposed to radiation and knowing the elapsed time between exposure and sampling.

3. Selection bias in the survivors?

Whether the survivors are representative of the general population in various biological aspects is an important issue in the application of epidemiological risk assessment. Although the current lymphocyte dose-survival study does not show any evidence for the presence of interindividual variation when exposed and non-exposed individuals were compared, further studies from different point of view would be useful for the characterization of the cohort, such as HLA typing.

4. Immunological study

Is decreased immune function among the survivors related to a decreased repertoire of immune cells? This is one of the oldest but still unresolved questions and it is hoped to be understood in near future.