EDITORIAL

Funding crisis at the Radiation Effects Research Foundation

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Funding crisis at the Radiation Effects Research Foundation

The US government is considering a drastic cut in funds for the coming financial year at the Radiation Effects Research Foundation (RERF), the US–Japanese bi-national body responsible for collecting, collating and analysing data on the survivors of the atomic bombings of Hiroshima and Nagasaki, and their children (Malakoff and Normile 2004). As we argue, below and elsewhere (Little et al 2004), this could be a scientific tragedy, potentially leading to a major loss of knowledge about the effects of ionising radiation on human health.

Why do the Japanese atomic bomb survivors matter so much? The survivors are unique among irradiated populations in that both sexes and a wide range of ages were exposed, comparable with those of a general population (Preston et al 2003). In contrast, occupationally-exposed groups (e.g. Cardis et al 1995) are generally exposed as adults, and most studies are predominantly male. Medically-exposed groups tend to have limited ages at exposure and only partial body exposures (Little 2001), and the underlying disease being treated may influence the future risk of development of chronic diseases such as cancer; because patients have previously had to be treated for, and survive, some serious disease (e.g., first primary cancer) they may not be representative of the general population. It is largely because of the age and gender characteristics of the survivor population and the wide range of generally uniform whole body doses that they received, including large numbers with low or moderate doses, that the Japanese atomic bomb survivor Life Span Study (LSS) cohort is the epidemiological ‘gold standard’ for assessing radiation health effects in humans. It is the principal source of data used by national and international scientific bodies to estimate risks of radiation-related cancer incidence and mortality (USNAS 1990, ICRP 1991, UNSCEAR 2000). The LSS is one of the longest and most comprehensive prospective cohort studies ever conducted, with information available on other important risk factors such as smoking (Pierce et al 2003) and diet (Sauvaget et al 2004). The tissue registries have facilitated many studies on the survivors (Preston et al 1994, Thompson et al 1994, Pierce and Preston 2000), and with the rapid advances in genome sequencing technology and statistical genetics these registries and the embedded Adult Health Study (AHS) have the potential to yield important information about the interaction of radiation and genetic risk factors as more biological samples and data on disease incidence are acquired.

Radiation-induced excess mortality and incidence risks of most cancer types have been observed in the LSS (Preston et al 1994, Thompson et al 1994, Pierce and Preston 2000, Preston et al 2003). There is substantial information in the LSS on the shape of the dose response in the low dose domain (Pierce and Preston 2000), and on modifiers of the dose response such as age at exposure, sex and lifestyle factors (Preston et al 2003, Sauvaget et al 2004). However, these important facets of radiation risk are incomplete, and it would be a significant loss of scientific knowledge to stop the work in midstream. Over the last decade radiation-associated increases of non-cancer mortality (e.g. cardiovascular disease, stroke, digestive and respiratory disease) in the LSS (Preston et al 2003) and morbidity in the parallel AHS (Wong et al 1994, Yamada et al 2004) have become apparent; it is anticipated that over the remainder of follow-up the total number of radiation-associated non-cancer deaths may approach those for radiation-induced cancer (Preston et al 2003). Furthermore, there is considerable uncertainty as to whether the
radiation dose-response for non-cancer disease risk is linear or has upward curvature (Preston et al 2003). Only continued follow-up will answer these questions.

Because 48% of the survivors are still alive (Preston et al 2003), there remain major uncertainties in the pattern of expression of risk across the lifespan. Most of the living survivors were exposed as children in 1945, and are just now entering the ages in which substantial numbers of cancers and other chronic diseases will arise. It is anticipated that 60–70% of the radiation-associated deaths (cancer and non-cancer) are yet to occur in the LSS (Preston et al 2003). Therefore, even after more than 50 years of study, there is much more to be learned from the study of the survivors who were children or in utero in 1945 and who are still alive. Given these perspectives, and the importance of the atomic bomb survivors as a basis for low dose radiation risk calculations and for learning about gene–radiation interactions, continued follow-up of the LSS and the AHS over the next 20–30 years is of the highest scientific and public health importance.

It is a measure of the importance of continuing the Japanese atomic bomb survivor cohort that a new set of dose estimates for the cohort, the so-called DS02 dosimetry, has been recently developed, funded at great expense primarily by the US and Japanese governments and approved for use at RERF by senior committees of both countries (Roessler 2003). The DS02 dosimetry, although (as it turned out) not substantially different from the previous (DS86) dose estimates, largely resolved apparent contradictions with thermal neutron dose activation measurements (Cullings and Fujita 2003, Huber et al 2003, Straume et al 2003) and thus validated in large part the estimates of radiation risk ascribed to gamma rays, the more relevant exposure to workers and, to a lesser extent, the general population.

Without a compensating increase in funding by the Japanese government the proposed US government funding cut, reported in Science (Malakoff and Normile 2004), would almost certainly lead to scientific staff reductions at RERF, especially in the important component of the American contributors to the study. This would result in weakening, if not termination, of the LSS, AHS, in utero and offspring studies, as well as the associated tissue registries and other ongoing programmes for the collection of biological samples (blood, serum, etc).

There is the potential, therefore, for very serious loss of knowledge about low dose human radiation effects. The RERF constitutes a major source of information on radiation risks for all countries and is highly deserving of adequate and continuous funding to prevent lasting deterioration of the scientific contribution of this unique investigation that benefits everyone (Adelstein et al 2004). The scientific questions addressed by RERF are not yet fully answered; future generations are unlikely either to understand or forgive us if we fail to complete the work that began nearly 60 years ago.

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