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Looking east from the center of Hiroshima, October 1945. In the left foreground had stood a shrine; its gate, 500 meters from the hypocenter, still stands.

# RESEARCHING A NIGHTMARE

**R**esearch is never without its data-collecting problems. In physics, the problem may be measuring accurately. In psychology, quantifying personality can prove tricky. In medicine, dealing with human subjects poses problems.

Researchers studying the effects of the atomic bombings are faced with these problems as well as the personal difficulty of dealing with the results of mankind's greatest nightmare on a day-to-day basis (see p. 274). The answers they seek are of more than academic importance. Their research may help the survivors and give clues to the genesis of cancer. As the only data base of human exposure to high levels of radiation, the results of health effects studies have been used to set radiation standards for industry.

Medical research into the effects of the atomic bombings got off to a slow start when the Occupying Forces removed all the pathological slides, specimens and reports and forbade scientific publication on A-bomb after-effects by Japanese doctors. When the ban was lifted and reports began appearing, another problem became apparent

—so many of the exposed people had died that differentiating between trends and chance occurrences was something of a guessing game. Detecting even a three- or four-fold increase in leukemia can prove difficult at first when the normal incidence is two or three per hundred thousand people — and that's about the size of your data base.

Not much animal research on radiation's effects existed, and what there was didn't provide a very good model. Radiation effects appear more gradually in humans than in animals, and such animal reactions to radiation as birth defects and accelerated aging have not appeared in *hibakusha* so far.

Determining the hypocenters was a matter of triangulating the blast signs, but even so the Nagasaki hypocenter had to be adjusted in the late 1970s. More difficult than setting the hypocenter is estimating radiation dose. In 1965 John Auxier of Oak Ridge National Laboratory in Tennessee calculated the amount of neutron and gamma radiation released by the two bombs. His estimate was used to determine the relationship between radiation and adverse health effects. But new calculations by Lawrence Livermore Laboratory researchers contradict the Oak Ridge data, and scientists are now arguing the validity of the

new data as well as their implications — some researchers say the new study indicates radiation is less harmful than was thought; others say the study shows radiation is more dangerous. The researchers themselves feel more work is needed before any conclusions are reached.

Medical researchers cite the cooperation of the Hiroshima and Nagasaki citizens as being of immense help in their research. Though autopsies are not the custom in Japan, *hibakusha* families have been compliant with the RERF and other researchers. Seventy-five percent of the people in the biennial exam study still return, though they get no treatment or money for their time. The compliance comes despite the feelings expressed by some *hibakusha* that the RERF and its forerunner, the Atomic Bomb Casualty Commission, treated them like guinea pigs by examining them but not offering care. The foundation's reply is that it is a research institution and the Hiroshima medical community with whom they share information is capable and qualified to give care.

In some cases questions had to be held until the proper techniques were developed. Cytogenetic procedures for visualizing chromosomes were not available until 1960, so genetic effects that occurred in the first 15 years after the bomb are a mystery.

—Joanne Silberner