RADIATION RISKS: THE ETHICS OF HEALTH PROTECTION

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Since the inception of commercial uses of nuclear technology, radiation protection standards established by regulatory agencies have reflected moral concerns based on two assumptions: (1) that the linear, zero-threshold hypothesis derives from scientific data in radiobiology which are virtually conclusive; (2) it is morally "better" for public health protection to assume that any radiation exposure, no matter how small, has some harmful effect which can and ought to be prevented. These assumptions have been reenforced by a popular belief that, since World War II, technological man has introduced into the biosphere enormous quantities of synthetic toxic substances contaminating an otherwise benign natural world. These include "unnatural" radiation sources as well as huge quantities of "sinister" chemicals with no natural equivalents.(1) Moreover, official policy has enshrined a quasi-dogma about synthetic substances, chemical and radioactive: it is "prudent" to assume that "even the most minute dose, even a single molecule, may trigger a lethal change in a cell that will cause it to multiply malignantly."(2)

In the past few years these beliefs and related assumptions have received closer scrutiny, revealing hidden reasons for regulatory selection of radiation risks as objects of paramount ethical concern, with the result that greater risks to health have escaped comparison and mitigation. Based on this scrutiny this brief paper explores two questions:

- Are presupposed assumptions ethically justified on grounds of scientific evidence and ethical consistency?
- Should moral objections claiming to invalidate comparative risk assessments be accepted or rejected?

RADIATION RISK SELECTION: SCIENTIFIC EVIDENCE AND IRONY

Radiation exposures from man-made technologies--whether for medical diagnosis or electricity generation--have been singled out as a unique cause of the dread disease of our age, cancer, as well as of genetic mutations affecting distant future generations. An entire ethical framework for social criticism has been erected on the scaffolding of beliefs which are at odds with the actual status of scientific evidence.

1. Hypothetical Harm. More than 25 years have been spent in developing radiation protection philosophy and standards--years dominated by a conservative assumption: every radiation dose greater than zero entails some possibility of somatic/genetic harm. The linear, zero-threshold hypothesis has led the public to believe that "there is no safe dose of radiation" and "every radiation dose is an overdose." Ethical objections appear to stand or fall on this hypothesis.

Professional ethics compels us to recognize that, despite a vast array of radiobiological data, there is no conclusive evidence to prove the existence or absence of a threshold. Moral objections assume the linear hypothesis to be an unassailable scientific conclusion; but in fact it is only an inconclusive theory, an extrapolated hypothesis, an ultra-conservative and protective rule of prudence. Humans could not exist if the linear hypothesis were applied to and enforced upon personal lifestyle exposures to natural terrestrial and cosmic radiation.

The absence of evidence of harm from low level exposure is not due to incompetence or lack of attempts to find effects. L. Taylor is unambiguous: "No one has been identifiably injured by radiation while working within the first numerical standards set by the NCRP and then the ICRP in 1934. Let us stop arguing about the people who are being injured by exposure to radiation at the levels far below those where any effects can be found. The fact is, the effects are not found despite over forty years of trying to find them. The theories about people being injured have still not led to the demonstration of injury and, though considered as facts by some, must only be looked upon as figments of the imagination."(3)

A profound misunderstanding of the inconclusive scientific status of the linear hypothesis renders moral arguments dependent on it inherently flawed.

2. Hormesis. It has been scientifically established that there are net beneficial effects from exposure to low levels of toxic substances, e.g. copper, selenium, fluoride. Professional ethics should compel competent members of the scientific community to examine radiobiological data through the lens of an hypothesis counter to--yet equally worthy of attention given--a linear, zero-threshold hypothesis. T. D. Luckey (4) has presented persuasive evidence that exposure to low-level radiation might have net beneficial effects. Indeed it may be essential for the continued well-being of living organisms which have evolved in relation to wide variations in exposure to natural radiation.

According to J. N. Stannard (5), the guideline of ALARA in USNRC regulations has been interpreted to mean, "If you can do it technically, you must do it" without any regard to excessive cost or more effective health protection. An ALARA guideline unjustifiably assumes that any degree of reduction in radiation exposure will do some good. However, evidence suggests three possible hormetic outcomes: (1) increased growth and fertility of both plant or animal organisms, (2) increased longevity, and (3) a reduction in cancer frequency.

3. Etiology of Cancer. Thirty years ago, when John Higginson ascribed the incidence of cancer in industrialized societies to "environmental causes," he meant a total environment--i.e. agricultural practices, hygiene, diet and behavior, social mores--not physical chemicals.(6) Through

misinterpretation and distortion, his complex theory has led people to believe that some carcinogen lurks in everything humans eat, drink and breathe. John Totter has shown that mortality from cancer appears independent of industrialization in a country and of its man-made pollution. He maintains that one should look for primary carcinogens--not among man-made agents--but among all-pervasive "normal" environmental components. Totter suggests that the culprit is oxygen: it is a recognized mutagen; experiments have shown that it causes tumors in fruit flies; in the Ames assay test for screening carcinogens, it shows up positive.(7)

To summarize: no scientific nor ethical justification exists for singling out radiation as a unique cause of cancer or genetic mutations when over a thousand other toxic agents in common commercial use are capable of producing the same health effects if exposed to them in sufficient doses. There is both an ethical and scientific basis for recognizing a practical threshold or de minimis dose below which risks of exposure are trivial and ought legally and morally to be ignored. A hypothetical harm can entail only a hypothetical violation of rights, fairness, equal protection and intergenerational equity.

COMPARATIVE RISK ASSESSMENT: FALLACY vs. REALITY

To counteract moral objections that radiation risks pose utterly unique threats to health, at least five methods of comparative risk assessment have evolved: (1) comparisons among risks already widely accepted by the public with "new" risks; (2) comparisons among risks of alternative ways of achieving the same objective; (3) comparing technology-induced radiation exposures with natural background; (4) comparison of risks with benefits to be achieved; (5) comparative measures of the cost-effectiveness of various risk-reduction options.

Critics of comparative risk assessment object that each method "begs the question of why an increase in risk, however small, should be acceptable."(8) These methods are also attacked because they assume that radiation risks are not unique but commensurable with other risks, so that expenditures for risk reduction can achieve "equity" by a more economically efficient use of dollars-per-life-saved.(9)

The first objection commits the fallacy of misplaced concreteness. It is fradulent to isolate one technology in such a way that it only represents incremental risks--as if these were simple additions to a current risk background. To the contrary, any "new" risk in reality reorders an entire system by displacing, offsetting, substituting for, or otherwise restructuring a prior pattern of benefits and harms. Only systemic risk analysis which surveys a total spectrum of threats to health, and endeavors to compare risk-reduction options and associated costs, can be expected to achieve the most equitable health protection for an entire population.

The incommensurability objection claims that "efficient use" of risk-reduction dollars cannot achieve "equity" because risk is not distributed in a population equally, nor is "efficient life saving" the only goal of safety policy. The objection fails on two accounts: it confuses "efficiency" with effectiveness, and it misinterprets "equal protection" as absolute protection. It is an inescapable reality that a public policy cannot possibly "do no harm." Even the most conscientious of policies will entail risks of some unintended harm to some hypothetical individual. When we compare more or less cost-effective methods of reducing risks to people and the biosphere, and compare net benefits, we are not wielding utilitarian tools for placing a callous dollar-value on human life or impairment as a moral judgment of individual worth. Much less are we estimating economic losses to society as a measure of personal expendability sacrificed to achieve technological advancement or "benefits" to an abstract society. In the real world of decisions about setting priorities for allocating public money, we are maximizing the value we place on human life by endeavoring to reduce widespread harm, thereby preventing diminished quality of life and premature loss of life expectancy. These decisions are covenantal expressions of our common humanity.

In conclusion, a fundamental ethical imperative of fairness should prevent moral concerns for health protection from being trivialized by an obsession with hypothetical health effects from but one technology, thus siphoning public concern away from preventable causes of widespread disease, malnutrition, morbidity and death claiming thousands of lives daily, and endangering a basic set of conditions for the well-being of our posterity.

REFERENCES

1. Carson, R. (1962) Silent Spring. Greenwich, Conn.:Fawcett. p. 16.
2. Efron, E. (1984) The Apocalyptics. New York: Simon & Schuster. p. 76.
3. Taylor, L. (1980) "Some Nonscientific Influences on Radiation Protection Standards and Practice," Health Physics. 39: 851-874.
4. Luckey, T.D. (1980) Hormesis With Ionizing Radiation. Boca Raton, FL.: CRC Press.
5. Stannard, J. N. (1976) Testimony, Environmental Radiation Requirements...Supplementary Information on Proposed Standards. Washington, D.C.
6. Higginson, J. (1979) "Cancer and the Enviromment: Higginson Speaks Out," Science. 205-1363-66.
7. Totter, J.R. (1982) "Spontaneous Cancer and Its Possible Relationship to Oxygen Metabolism," Proceedings of the National Academy of Sciences. Washington, D.C.
8. Burton, I. (1982) "At What Risk," Energy Forum. 18:10-12.
9. Shrader, Frechette, K. S. (1985) Risk Analysis and Scientific method. Dordrecht: D. Reidel. p. 63 ff.