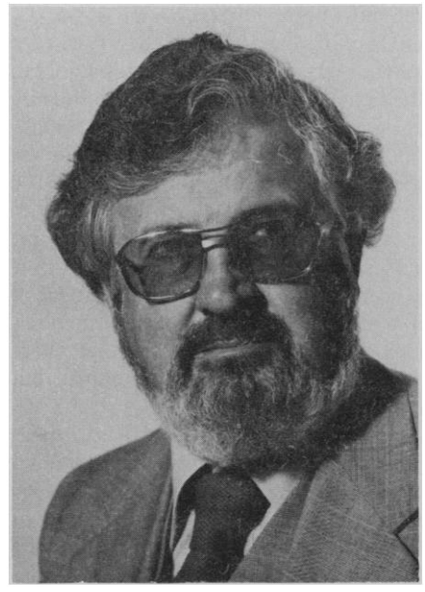
There he came into contact with two members, Milton Silverman and Philip Lee. Lee was then the assistant secretary of Health, Education, and Welfare. Silverman taught at UCSF, and Lee was to become chancellor; they are the authors of the book, *Pills, Profits, and Politics*. Lee describes Goyen as "a real pioneer, and an outstanding leader who is willing to put himself out for the things he believes in."

Goyan's predecessor, Donald Kennedy, has also praised Goyan's leadership. Kennedy, as Goyan acknowledges, is a tough act to follow. Both men distinguished themselves as scientists before successful administrative careers (Goyan in research on the dissolution and degradation rates of drugs).

Goyan's style is different from Kennedy's, however. The latter commanded respect as an articulate spokesman for the agency before its constituents; Goyan is more likely to achieve esteem as an internal manager, his acquaintances say. Goyan himself says he wants "foremost to build on the strengths of the organization with more and better research. The people at FDA are not the leaders in the field of food and drug science." Like his predecessor, Goyan is determined to attract better personnel and to increase FDA salaries. He may be less interested in cultivating external



*Jere E. Goyan*

appreciation: "I happen to be a somewhat flippant human being," he says. "It would be silly for me to drop the style that got me where I am."

Goyan relates that a speech he made in 1974 at a meeting of the Institute of Medicine prompted an official of the Florida Medical Society to write to the UCSF chancellor, demanding Goyan's resignation. Goyan had told the audience of mostly physicians that "I staunchly refuse to accept the notion that any physician, merely because he graduated from medical school and is currently a card-carrying member of his or her county medical society, is great, or good, or even tolerably competent. Too much of drug therapy has been atrociously irrational."

Goyan says that he is now on good terms with academic physicians, and that his initial nomination for the FDA post came from a list compiled by the American College of Physicians.

Before he was offered the job, he was interviewed by former HEW Secretary Joseph Califano, assistant secretary for health Julius Richmond, Gilbert Omenn of the Office of Science and Technology Policy in the White House, and the new Secretary of HEW, Patricia Harris. Califano, whose interview with Goyan occurred the day of Carter's cabinet shake-up, asked only about Goyan's experience handling large budgets, and about Goyan's views on food additives, the stickiest problem to confront each of the last two FDA commissioners. Harris asked about the Delaney amendment to the Food and Drug law banning carcinogenic additives, and about the prescription pain-killer Darvon. Goyan says his answers to each of these questions will soon become evident. He takes office on 22 October.—R. JEFFREY SMITH

# Nationwide Protection from Iodine-131 Urged

## *In Three Mile Island study two nuclear physicists call for general distribution of thyroid blocking agent*

The President's Commission on Three Mile Island has under review a report by two nuclear physicists at Princeton University who are calling for measures to protect populations living at distances up to at least 100 miles from nuclear reactors. In particular, they advocate virtually nationwide distribution of potassium iodide, which can block the uptake of radioactive iodine by the thyroid gland; their report suggests, for example, that a supply of the medicine might be fastened to electricity meters.

This proposal may arouse controversy because if it should be accepted by the President's commission and by federal and state health and regulatory authorities this might seem to imply that nuclear power is hardly the safe, clean energy source that the nuclear industry has long represented it to be. But Pennsylvania's secretary of health, Gordon MacLeod, and a number of prominent experts on health physics and nuclear matters warmly endorse the idea of distributing potassium iodide, although some are uncertain how best to do it.

The report, still in draft and now being circulated for review, was prepared for the Council on Environmental Quality (CEQ) by Jan Beyea and Frank Von Hippel, both of Princeton's Center for Energy and Environmental Studies. Beyea has been a consultant to Sweden, Germany, and the State of New Jersey on nuclear safety issues. Von Hippel was a member of the scientific panel whose recommendations last year led the Nuclear Regulatory Commission (NRC) to reject the conclusions of the Reactor Safety Study, or "Rasmussen Report," which had been cited by the nuclear industry as evidence that nuclear power is safe.

CEQ sent the draft report to the President's commission on 10 September, and one of the members, Russell Peterson, the former Dupont R & D administrator and governor of Delaware who chaired CEQ under Presidents Nixon and Ford, brought it up at a commission meeting in mid-September.

The discussion is said to have been brief and inconclusive, and the question of distributing potassium iodide was not addressed at all. But Peterson, who earlier this year resigned as director of the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Office of Technology Assessment to become president of the National Audubon Society, will seek to have the commission return to the Beyea-Von Hippel report when it prepares its recommendations. He believes strongly that the report is correct in its insistence that there is "an imbalance between the enormous resources . . . devoted to *accident prevention* and the almost negligible resources . . . devoted to the development of *consequence mitigation strategies*" (emphasis in the original).

"We came awfully close to a catastrophic accident at Three Mile Island," Peterson told *Science*. "The combination of circumstances and events which occurred there say to me that the probability is high that sometime, someplace there will be a catastrophic accident. The [Beyea-Von Hippel] report should therefore be taken damned seriously."

Peterson noted that the report indicates that, if a large release of radioactivity had occurred and been carried by a southwest wind over northern New Jersey and New York, more than $7\frac{1}{2}$ million people would have been in the path of the invisible radioactive plume.

The report does not attempt to assess quantitatively the probability of a reactor accident involving a large release of radioactivity, nor does it deal with the question as to how near the Three Mile Island accident came to a large release. What it does is set forth some of the possible long-term consequences for distant populations and areas—50 miles or more downwind—had the accident been worse and the releases larger.

These scenarios range from one describing an accident just slightly more severe than the one that actually occurred, to one involving the meltdown of a "mature" reactor core (fuel in the core at Three Mile Island had been irradiated for only 3 months and contained far fewer long-lived fission products than the average reactor core), a breach of the containment, and a major release of radioactivity of the kind hypothesized in the Rasmussen study. In the latter case, the numbers of "delayed cancer deaths" (occurring over a 75-year period) attributable to the accident are estimated at from 550 to 60,000, excluding the cancer deaths suffered in the population living within 50 miles of the reactor.

In arriving at the higher number the authors assumed that the plume of radioactivity is blown toward New York City, and they used the "most pessimistic coefficient relating dose to health effects." Conversely, they based the lower number partly on the assumption that the plume is blown toward Maryland's lightly populated Eastern Shore and partly on the most optimistic reckoning of the coefficient of dose to health effects. The incidence of genetic defects attributable to the radiation release is held to be roughly equal to the incidence of cancer deaths.

The report also estimates that, for the worst release, there would be from 3500 to 450,000 cases of benign thyroid nodules, many of which would require surgery. For the smallest release (with 5 percent of the iodines and 60 percent of noble gases escaping from the containment) the report estimates that there would be from 200 to 27,000 nodules, but only 3 to 350 fatal cancers.

All significant releases of radioactivity would lead to temporary contamination of land areas ranging in size from 25,000 square miles to an area several times that of Pennsylvania. If iodine-131 should be the most dangerous nuclide released, the contamination would be relatively brief, for it has a half-life of only about 8 days. More severe accidents resulting in the release of cesium (which has a 30-year half-life) and other long-lived fission products would cause the contamination of up to 5300 square miles for years. In such circumstances, the population would have to be relocated and massive efforts at decontamination undertaken.

"Delayed cancers and genetic defects due to radiation from ground and buildings contaminated with long-lived radioactive cesium could be one of the largest consequences from a major release," Beyea and Von Hippel say. "Research on decontamination should be given a high priority."

Addressing the question of how to respond to a major reactor accident, the authors point out that to try to evacuate people living in the path of the radioactive plume simply would not be practical at distances greater than 50 miles from the reactor site, if indeed it would be practical beyond 10 or 20 miles.

They say, however, that the "availability of thyroid protection medicine, sheltering in buildings, and air filters could all prove valuable in reducing radiation doses and the associated increased incidence of thyroid damage, cancer, and other effects of low-level radiation. . . ." Emergency planning for areas from 50 to 100 miles or more distant from specific reactors "may require cooperation between different states and, in some cases, cooperation with Canada and Mexico," they said.

They recommend that containment buildings for existing reactors be backfitted with systems for the rapid filtration of "large volumes of radioactivity-con-

*(Continued on page 204)*

## Carter's Tellico Decision Offends Environmentalists

"Jimmy Carter has just lost 10,000 doorbell pushers in California," said Brock Evans, the Sierra Club's Washington director, apropos of the President's decision on 25 September not to veto the public works appropriations bill that mandates completion of the long-controversial Tellico Dam on the Little Tennessee River, home of the snail darter. What Evans meant was that the environmental community is now disappointed enough in Carter that, even if environmentalists in California and other states do not vote against him in the primaries and general election of 1980, they are unlikely to work for him, as many did in 1976.

Evans and several other environmental leaders commented bitterly on the President's decision at a Washington press conference. Evans said the Tellico decision is one of several "very serious hammer blows" Carter has dealt environmental interests this year. The other blows, he said, include Carter's decisions to increase the allowable "cut" in the national forest system and to propose an Energy Mobilization Board that could bypass environmental clearance procedures and maybe waive pollution control laws.

According to White House sources, the President knew full well that his decision to sign the appropriations bill would be strongly resented by environmentalists. The Tellico Dam issue is said to have put him in a genuine dilemma. He had pushed efforts to do away with the water projects pork barrel, of which the Tellico project had become a symbol (it was largely on economic grounds that the Tellico project was denied an exemption from the Endangered Species Act by a Cabinet-level council set up by Congress last year to review such cases). If the President signed the bill and thus allowed the dam to be completed, water policy reform would suffer a setback and his standing with the environmental groups would suffer. On the other hand, White House lobbyists who work the House and Senate were telling him that, if he vetoed the bill, the Endangered Species Act might be gutted or allowed to expire,


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taminated gases," to be used in situations where the venting of such gases might be necessary to cope with a leak in the containment, prevent a fire, or avert a breach of the containment from overpressurization or a steam or hydrogen explosion.

Beyea and Von Hippel observe that in the Rasmussen study releases of "intermediate" size were considered much less likely to occur than full-scale releases. This pre-Three Mile Island study, they say, "concluded in effect that reactors would tend to fail badly—or release hardly any radioactivity at all." The release that actually occurred in the Three Mile Island accident was slight (only a small percentage of the noble gases), but, in the authors' view, this accident underscores the importance of paying attention to releases of intermediate size in emergency planning.

Secretary MacLeod of the Pennsylvania health department already is developing a plan to buy, at a cost of more than $1 million, a 2 week's supply of potassium iodide tablets for the state's 11.7 million inhabitants. To go through with the plan, a safe and effective way for the tablets to be distributed to the population and kept for emergency use must be devised, and MacLeod is not yet sure how best to do this. (Potassium iodide can have side effects, such as a bad rash, and should therefore be used with care, MacLeod says.)

> "If we had passed out little brown vials of liquid, there would have been chaos."

Also, although in common use for many years as an expectorant, potassium iodide has not yet been approved for general use as a prophylactic medicine in radiation emergencies. Wallace Laboratories of Cranbury, New Jersey, has an application now pending before the Food and Drug Administration for the approval of the drug for this purpose.

In the midst of the Three Mile Island crisis, the then Secretary of Health, Education, and Welfare, Joseph A. Califano, had some 237,000 vials of potassium iodide manufactured and shipped to Harrisburg, with the first shipment arriving 4 days after the accident began. Califano urged that the drug be administered to everyone on Three Mile Island and distributed to everyone else living within a 10-mile radius of the reactor, but the state officials refused to do either.

"There was already a panic. Fifty thousand people had left their homes, and people were drawing money out of the bank," MacLeod recalls. "If we had passed out little brown vials of liquid, I'm sure there would have been chaos." But, fortunately, says MacLeod, by this time the Nuclear Regulatory Commission officials on the scene were confident that there was no danger of a hydrogen explosion and possible breach of the containment.

With the memory of these harrowing days still fresh, MacLeod wants to be sure that, in the event of another reactor accident, he and the governor will not again find themselves in a dilemma. He wants all Pennsylvanians to have immediately at hand the potassium iodide necessary to protect themselves at least from iodine-131, with officials not having to worry about giving out the drug and maybe precipitating a panic.

Arthur Upton, director of the National Cancer Institute and an expert on radiation biology, told *Science* that he, too, favors distributing potassium iodide as a precaution against possible nuclear accidents. He noted that the 1977 Ford Foundation–sponsored report *Nuclear Power Issues and Choices*, which he helped prepare, estimated that the chance of an "extremely serious" reactor accident occurring by the year 2000 was as great as one in four. This was 2 years before Three Mile Island.

Others who have said they favor the kind of precautionary potassium iodide program advocated by Beyea and Von Hippel include Alvin Weinberg, former director of the Oak Ridge National Laboratory, and Merril Eisenbud, professor of environmental medicine at New York University and the scientist who, in the early 1960's, was among the first to discover that this drug can block thyroid uptake of iodine-131.

Curiously, Von Hippel found himself rebuffed in his first attempt to discuss his and Beyea's proposal with the Three Mile Island Commission staff. Accompanied by Theodore Taylor, a member of the commission and a colleague of his at Princeton, Von Hippel on 8 August met with William Stratton, a senior staff scientist and a former chairman of the old Atomic Energy Commission's Advisory Committee on Reactor Safeguards.

Describing this encounter later in a letter to John G. Kemeny, the commission's chairman, Von Hippel said that Stratton dismissed out of hand his calculations indicating that thyroid protection might be required hundreds of miles downwind from a nuclear accident. "He stated that if I were really concerned about the public safety, I would not trouble myself with nuclear power plants but would spend my time on other more important issues—chlorine storage tank accidents, for instance."

Von Hippel said Stratton was certain that the Nuclear Regulatory Commission (NRC) was developing an adequate thyroid protection strategy, this despite his best efforts to tell Stratton the NRC had not yet looked seriously at "consequence mitigation strategies other than the evacuation of populations within 10 to 20 miles of a reactor accident." When *Science* asked Stratton about this meeting and Von Hippel's characterization of it, he would only say, "It sounds like an extraordinarily interesting letter."

Favorable action by the FDA on the Wallace Laboratories potassium iodide application is expected shortly. Nonetheless, John C. Villforth, director of FDA's bureau of radiological health, told *Science* that general distribution of the drug against the chance of a major reactor accident was a "dumb idea" and that he had so testified before the Three Mile Island Commission. He cited problems of side effects and limited shelf life, and said that the public might regard the drug as a "panacea," when in fact the only radiation hazard that it is effective against is that posed by iodine-131. In his view, potassium iodide should be readily available for use in radiation emergencies but should not be distributed in advance to every household.

As Villforth's comments suggest, there may be a lively debate in the making over the best and safest way to get the drug into the hands of those who will need it in an emergency. In particular, the idea of attaching a supply of the drug to electric meters, which Beyea and Von Hippel put forward merely as an example of what could be done, will be attacked by some as crazy and impractical.

But the positive response the Beyea–Von Hippel report has gotten from Peterson and others may well be a sign that emergency planning for reactor accidents will now receive far more emphasis than in the past and that potassium iodide will find an important place in it. In England this has long been true, at least in some measure. Potassium *iodate*, which has a longer shelf life than the drug in its iodide form, has for years been kept available for people in the vicinity of reactor sites, although not for those living at a distance.

—LUTHER J. CARTER