**EDITORIAL**

# How Harmful to Others Are Iodine-131 Treated Patients

The key question in the minds of the reader is not can contamination be expected, but rather, can this be expected to hurt anyone (is there significant risk involved). Ibis et al. are relatively silent on this important question except in the last paragraph, where they make some general comments about there being no evidence that $^{131}I$ therapy presents a major public health risk. There is no use of the results of their own data in these general comments.

The paper does present evidence that doses of hundreds of millicuries present minimal hazards to medical personnel (e.g., no significant thyroid uptake). Nevertheless, the impression one gets from the paper is the opposite, namely that because all this contamination has been observed, there must be a risk.

The word "significant" is repeatedly used (for example, the first line of the Summary) to mean significantly above NRC limits rather than a significant risk. We have long had a problem with NRC surface contamination limits; we feel (together with some other health physicists) that the expected dose from surface contamination at the NRC limit poses minimal risk. Computer simulations are becoming available which tend to bear this out (i.e., the 200 dpm/100 $cm^2$ $^{131}I$ surface contamination limit for unrestricted use will generally make a negligible contribution to public dose) (*1*).

It was reported that, for the largest dose, the air concentration exceeded MPC values. However, the NRC limit is not the air concentration, but the MPC-hr a worker is exposed to during a calendar quarter. If the MPC (based on a 40-hr wk, 520 hr per quarter) was exceeded for only 24 hr, then the exposure is on the order of 30-MPC hr even if an employee were to be present in the room for the entire 24 hr; the quarterly limit is 520. Of course, if the same employee participated in more than one therapy in the quarter, additional MPC-hr would be accumulated.

The NRC requires that patients being treated for thyroid cancer with $^{131}I$ should be hospitalized until their body content of radioactivity falls below 30 mCi in order to ensure "good housekeeping" practices under the excellent supervision of radiation health physicists and carefully instructed nurses who are experienced in this type of care.

As an example, this article has reiterated the point that men should sit down on the toilet to urinate because if they don't they routinely contaminate the toilet seat and the floor around the toilet with twice the amount of radioactivity deposits.

The most important point to be addressed, however, is not that patients who are treated for thyroid cancer with radioactive iodine contaminate the environment while in the hospital, but does this treatment pose a real hazard to workers, family and the public after they leave the hospital.

Figure 1 shows that the skin activity has decreased more than 50% between 24 and 48 hr after the dose. The NRC has already decreed that all patients can be discharged and return to all normal activities after the amount of $^{131}I$ in the body has fallen to less than 30 mCi. This usually occurs about 48 hr after the treatment dose is given.

If patients further wish to decrease the radiation exposure to others, the Society of Nuclear Medicine has published a "pamphlet" giving patients guidelines on how they may do this (*2*). Culver and Dworkin (*3*) have recommended more restrictions lasting for 2 wk after a patient is treated for Graves' disease with doses smaller than 30 mCi.

Jacobsen et al. (*4*) found that the highest source of radioactivity contamination in the home after discharge following treatment with $^{131}I$ for hyperthyroidism and thyroid cancer was saliva. The most contaminated source was the telephone. The least contaminated household was "Patient No. 3 who employed usual precautions given by her attending physician. She rarely touched the children and attempted to remain at a one meter distance from them whenever possible."

As the physician who talks to these patients, however, I (WHB) find that suggestions that the mother of little children should hire a babysitter to care for the children for 2 or 3 wk to avoid radiation hazard for the children usually alarms the mother who is already frightened by her "cancer."

We have found no harmful effects in 103 children 3 to 18 yr of age with thyroid cancer treated with a mean dose of 191 mCi of $^{131}I$ with a maximum of 690 mCi, followed for a mean period of 22 yr, with a maximum of 42 yr (*5*). We failed to produce any clinical evidence of harm to the child who actually swallowed the treatment dose of $^{131}I$.

In a previous publication (*6*), we demonstrated no decrease in fertility of these children or abnormal birth history as compared to an age- and sex-matched normal population in the same time frame. We also have found similar results in 756 adults (*7*).

Most clinical radiation studies demonstrating harmful effects relate to atom bomb surveys and x-ray; for example, relating childhood leukemia to prenatal diagnostic x-rays.

No one has demonstrated harmful radiation effects of radioactive iodine given to more than a million people in the treatment of thyrotoxicosis (*8*). Hamberger (*9*) initially did not want to use $^{131}I$ in the treatment of thyro-

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toxicosis in 262 children 3 to 18 yr of age treated for hyperthyroidism from 1947 to 1984. Of the 239 whose treatment was complete, 91 (38%) ultimately had $^{131}$I treatment. Hamberger concluded that "radioiodine therapy is a safe, simple and economic therapy—and is now considered the initial treatment of choice for such patients."

In summary, studies of sources and amounts of contamination in patients treated for thyroid cancer while in the hospital and shortly after discharge are important to give us ideas in how to cut down radiation exposure to others who are not being treated, but there are no data to justify using other less effective treatments or to further frighten patients and their relatives.

Indeed, the American College of Nuclear Medicine has submitted a petition to the NRC to consider the need to allow use of amounts greater than 30 mCi in diagnostic studies and add a definition of the term confinement.

The petitioner requests amendments to 10 CFR part 35 that would clarify the requirement for ambulatory patients receiving oral or intravenous radiopharmaceuticals in amounts greater than 30 mCi and would allow treatment on an outpatient basis if they qualify medically.

The petitioner claims that scientific studies support the finding that diagnosing and treating patients on an outpatient basis with radiopharmaceuticals in doses greater than 30 mCi would not create a safety hazard to the public.

Allen (*10*), with the approval of the Texas State Department of Health, started a prospective study 30 yr ago on 430 ambulatory patients confined to their homes until the total body burden decreased to less than 30 mCi. They reported that their data indicated that there was no health hazard to family members or the general public.

Buchan and Brindle (*11*) studied the amount of $^{131}$I deposited in the thyroid glands of household members of 35 persons treated for hyperthyroidism with $^{131}$I. They concluded that "except where very young children are involved, precautions to minimize contamination should be abandoned. It is further suggested that there need be no upper limit of $^{131}$I activity for out-patient treatment in so far as contamination hazards are concerned."

Culver and Dworkin published an article on this subject while this editorial was being written (*12*).

They suggested that patients being treated for thyroid cancer who were released from the hospital when their body content reached <30 mCi of $^{131}$I (based upon exposure rates 2 mr/hr or less at 1 meter, 0.6 meter, or 0.1 meter distance from family members) were less of a hazard than patients treated for hyperthyroidism because the thyroid gland in hyperthyroidism retained a higher percent of the administered dose of $^{131}$I longer. Their Table 2 encouraged restriction of time near others at 1 meter at 0-1 day post-discharge. There were no restrictions at 2-4 days at 0.6 and 1.0 meters. No restrictions are necessary at 5–7 days at 0.3, 0.6, or 1.0 meters.

We hope that these guidelines will satisfy the most fastidious worriers. The senior author (WHB) is biased for the safety to others of $^{131}$I for treatment of thyroid cancer and hyperthyroidism because of 45 yr of participation in the treatment and follow-up of nearly 1,000 thyroid cancer patients and about 5,000 patients with hyperthyroidism.

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