

# Reassessing Radium's Risks

## Military men and children may unwittingly have participated in a massive radiation "experiment"

By JANET RALOFF

**D**uring World War II, ear problems threatened the effectiveness of several branches of the U.S. military. Within the Army Air Forces, aerotitis media proved the leading flight-related ailment.

Without pressurized cockpits, afflicted aviators undertaking a large descent in altitude — and, therefore, increase in atmospheric pressure — experienced pain, temporary deafness, and any of a host of other symptoms that included vertigo, nausea, a ringing in the ears, bleeding, even a ruptured eardrum. The problem traced to difficulties equalizing pressure within the middle ear to that of the outside environment.

As a letter from one military surgeon described it: "We constantly deal with...chronically recurring aerotitis....The usual story is that a mission is flown, followed by subsequent grounding for several days or weeks...and then the cycle is repeated." In the end, he concluded, these men "are not available for combat duty a third of the time."

Many divers and caisson workers experienced identical problems adjusting to pressure changes as they descended to conduct undersea work. A 1991 survey for the U.S. Navy reported a "30 percent attrition rate of submarine students due to [aerotitis media] during the critical years of World War II."

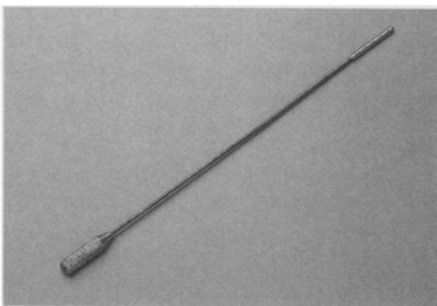
To cope with this drain on its combat readiness, in 1944 the U.S. military embraced an experimental therapy developed at Johns Hopkins University in Baltimore. Military physicians found that by inserting an encapsulated source of radium deep into the nostrils of each affected serviceman for several minutes, they could reduce symptoms — and sometimes eliminate them — in roughly 90 percent of those treated.

A single procedure sometimes sufficed. The preferred regimen, however, involved three treatments delivered 25 to 30 days apart — with occasional follow-ups if and when the condition recurred weeks to years later.

This therapy also delivered a hefty dose of radiation to small regions at the base of the brain. Indeed, while curing aerotitis in most treated servicemen, this procedure may have sown the seeds for subsequent cancers and other chronic disorders, contends the Submarine Sur-

vivors Group (SSG). This Quincy, Mass.-based organization serves as a clearinghouse for information on possible risks of the treatment.

A telephone hotline that SSG established in February has logged calls from more than 83,000 individuals who say they received the nasopharyngeal-radium therapy — some 32,000 of them military veterans. Many callers also report unusual cancers or a history of medical conditions that could trace to organs that may have received substantial radiation doses during treatment.



Leah Anderson

**A** 6¼-inch (17 cm) long, "dummy" (nonradioactive) nasopharyngeal-radium applicator from FDA's historical collection of radiation-therapy devices.

**"T**his is an absolutely staggering situation — and opportunity," argues health physicist Stewart Farber of Pawtucket, R.I., who serves as SSG's science adviser. There has long been a question about how radiation affects the human brain and nearby organs. The answer — which may come from these radium-treated individuals — "could be very beneficial to the government," Farber believes.

For instance, he suspects that understanding the radiation sensitivity of organs in the head could help establish the risks to people living downwind of many U.S. nuclear-weapons facilities — such as the Hanford reservation in Richland, Wash. Many downwinders have attributed health problems to inadvertent radiation exposures.

Previously, radiation biologists have focused their attention on Hiroshima and Nagasaki bomb survivors when calculating effects of low to moderate doses of gamma radiation (high doses severely crippled or killed bomb victims).

However, Farber notes that estimates

of individual doses received by the bomb survivors are fuzzy at best. Moreover, he says, contact doses to nasal tissue in radium-therapy patients typically met or exceeded estimates of those that bomb survivors received to the same tissues.

"I've done some very rigorous dose calculations," Farber says. And in the aerotitis treatments, "you're talking contact doses over the full 2-centimeter (cm) radium source of 2,000 rem." Even at a depth of 1 cm, he said, "you would have had [an absorbed] dose of about 300 rem" — most of it from gamma radiation. These are comparable to the therapeutic doses delivered to cancer patients during radiation therapy.

But what most impresses Farber is the number of radium-treatment patients that may be available for follow-up study — conservatively 250,000, and perhaps 1 million who were exposed as healthy children and young men. The 30 to 50 years that have elapsed since their treatment should be long enough for risks of even long-latency cancers or other diseases to have emerged.

In a way, Farber says, nasopharyngeal-radium therapy "was probably the biggest controlled [radiation] experiment ever done — and no population like this is likely ever to exist again." He argues that the federal government must quickly begin surveying this group.

**W**hile such a study "won't be easy, I think it is important to do," agrees Dale P. Sandler of the National Institute of Environmental Health Sciences in Research Triangle Park, N.C. In the late 1970s, she surveyed the health of adults who as children received radium to stave off deafness.

Her study compared 904 radium-treated individuals with 2,021 others who had come to the same clinic as children and received either adenoid/tonsil surgery or no treatment. Her data, reported in the January 1982 *JOURNAL OF THE NATIONAL CANCER INSTITUTE*, showed an increased risk of brain cancers within the treated group — three where none were expected.

Her group also found the overall incidence of head-and-neck tumors doubled in the radium-treated group and one class of noncancerous thyroid diseases elevated almost eightfold.

To date, she notes, no one has sought to confirm the apparent cancer increase. Someone should, she maintains, because her data came from cancer registries that listed malignancies only by type and general site.

"The focus of my study was cancer," Sandler recalls. "But I was also really concerned about what happens when you irradiate the pituitary." When the children were treated, she says, the base of this gland "would have been about 1 to 2 centimeters from where the applicators would have hit." As a result, "the pituitary was getting a lot [of radiation] — 200 to 400 rem."

Though her study turned up some unusual results that might stem from pituitary-related hormone changes, "we weren't equipped to follow them up," she says. "If I were doing this study now, I would be interested in looking for reproductive disturbances and [noncancerous] thyroid disease" that might reflect hormone abnormalities. In particular, she says, one might look for delayed menarche, delayed childbirth, infertility, or early onset of menopause.

Nasopharyngeal-radium-treated populations also may face a higher risk of benign pituitary tumors. These "are hard to detect — and probably would go undetected — but might manifest themselves as growth disturbances," Sandler says.

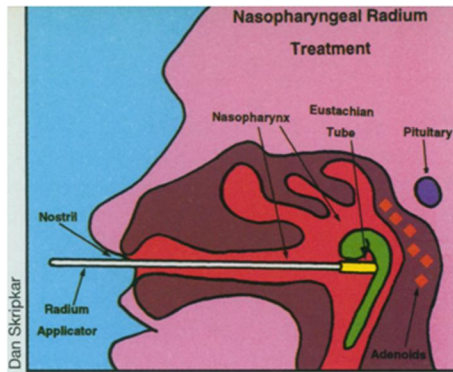
Johns Hopkins University, where Sandler conducted her radium-therapy study, has just begun a follow-up of the population she investigated.

Sandler also advocates a follow-up of persons irradiated as adults. But she cautions against attempting to calculate treatment-related risks using people identified through the submariners' telephone hotline — without medical records to confirm any reported diseases. Moreover, she warns, risks identified from this group may exaggerate the true risks because people who experience health problems are more likely to phone than those who are healthy.

**F**arber agrees, but says that until the military reveals who it irradiated, the hotline may remain the best gauge of the number of adults treated and who they are.

In May, White House aide Christine A. Varney reported to Sen. Joseph I. Lieberman (D-Conn.) that the Defense Department was conducting "an extensive search" to identify veterans irradiated during their service. Four months later, when Lieberman had yet to learn of any progress, he wrote President Clinton, urging an epidemiological study of persons treated with nasopharyngeal radium.

At a hearing two weeks ago of the Senate Clean Air and Nuclear Regulation subcommittee, which Lieberman chairs, fed-



**C**ross section of nasal cavity shows position of rigid, metal treatment device. The rod's 2-centimeter-long radium-encapsulating tip (yellow) was lodged in each nostril for 6 to 12 minutes at a time.

eral witnesses told the senator that treated individuals must be identified before such a study can be contemplated. And Maj. Gen. Robert A. Buethe Jr., acting Surgeon General of the Air Force, reported his agency could find "no consolidated listing of who received the therapy."

Added Susan Mather, an assistant chief medical director with the Department of Veterans Affairs (VA), "I'm convinced there isn't such a [central] roster" of treated servicemen.

But with the help of names provided by the Submarine Survivors Group, the VA last month began investigating the possibility of tracking the medical records of vets who had identified themselves as having received nasopharyngeal-radium treatments. From such a list, Mather noted, it might be possible to "work backwards" and identify other vets who were similarly treated.

Her agency is already committed to investigating the feasibility of launching an epidemiological study of causes of death among treated servicemen, she said. While a study of unusual rates of nonlethal diseases among these men

## Why radium?

In today's heightened awareness of radiation's dangers, treating people with relatively high, localized doses of radiation for nonlife-threatening conditions may sound harebrained.

But throughout the 1950s, radium treatment for such conditions as inflamed adenoids and tonsils, acne, ringworm of the scalp, trouble hearing, and otitis media "was considered good medical practice and effective treatment," notes presidential assistant Christine A. Varney.

Indeed, radiation treatment for a number of these problems makes intuitive sense. Studies of fliers and submariners during World War II, for one, revealed excessive lymphoid tissue around the ends of eustachian tubes as a leading risk factor for susceptibility to aerotitis media. Exposing such tissue to gamma radiation usually shrunk it

would be far more useful, Mather noted that such a study also would cost more and take longer — major limitations when resources are tight.

What about the hundreds of thousands of civilians, mostly children, who received the radium treatments?

The federal Centers for Disease Control and Prevention (CDC) in Atlanta would be the natural choice to follow them up. But CDC director David Satcher wrote Lieberman that "Currently, we do not have the personnel or financial resources."

**J**im Garrity is a 47-year-old computer programmer and ex-submariner who received nasopharyngeal-radium treatment for aerotitis media in 1966. This past March, a month after he set up the Submarine Survivors Group — an organization he supports largely with his own money — he was diagnosed with advanced nasopharyngeal cancer.

Is he resentful that the Navy treated him with radium? "Not really," he told SCIENCE NEWS. Without it he could never have served on a sub — an assignment of which he remains proud.

Moreover, he says, "Now is not the time to be pointing fingers and blaming anybody. Now is the time to get to work and help people" by getting the word out that radium therapy may place individuals at heightened risk of certain diseases. Several who went for medical checkups after hearing his message have called back with thanks — including a few whose tumors appear to have been caught before they turned life-threatening.

"As I tell my wife," says Garrity, now undergoing chemotherapy, "if I can save one person with my [SSG] work, I think it will have all been worth it." □

enough to free any blocked eustachian-tube valves so that the middle ear's pressure could equalize with that outside.

Moreover, notes Paul Frame, a health physicist with Oak Ridge (Tenn.) Associated Universities, physicians at that time knew radiation could damage and kill off tissue. But they also knew that the brain and central nervous system were relatively resistant to radiation. And so, he suggests, researchers in the 1940s and '50s "probably were of the opinion that this [radium treatment] was unlikely to result in significant damage."

As the risks of such exposures emerged, enthusiasm for radium waned. By the 1960s, federal officials warned physicians to abandon the use of radium and to dispose of applicators still in their possession. —J.A. Raloff