NUTRITION

Fallout Will Change Food Habits

Increased fallout in foods may force a change in diet habits. Foods high in nutrition also have high levels of radioactive contamination, Lillian Levy reports.

➤ TO AVOID poisonous fallout in foods, it will be necessary to change current eating habits and dietary practice because the diet that is best nutritionally is not the most healthful in this atomic age.

Bake and eat potatoes, but not with their skins. Peel and core apples before eating. Corn is safe from fallout contamination if kept in husks until milled. Bread and cereal from processed grains are safer than whole grain products.

Foods such as milk, whole wheat, green leafy vegetables and legumes—all rich in body-building proteins, vitamins and minerals—also contain the largest amounts of cancer-causing radioactive fallout such as strontium-90, surveys by the U. S. Food and Drug Administration have shown.

According to present standards of nutrition which were developed prior to fallout, the best diet includes these foods. Experiments have shown that their regular consumption results in better physical development, greater resistance to disease, increased mental vigor and longevity.

These benefits could, however, be negated if the amount of radiation from peaceful uses of atomic energy as well as from nuclear bomb tests increases significantly in the body-building foods. For, in addition to causing cancer, radiation adversely affects the nervous system, causes premature aging and shortens life expectancy.

For some time, the FDA has been evaluating radiation levels in foods and exploring ways to lower or remove the dangerous contamination. Its surveys, conducted under Dr. Edwin P. Laug, chief of the radioactivity branch, have largely concentrated on strontium-90.

Strontium-90 Most Dangerous

Strontium-90 is considered one of the most dangerous elements in fallout because it is long-lived, and, like calcium, tends to settle in the bone. It is a known cause of bone cancer and leukemia. Infants and children, whose calcium formations are incomplete, are particularly susceptible to strontium-90. The U. S. Public Health Service estimates that bone uptake of strontium-90 in children will double this year because of fallout from Soviet tests. If the United States resumes atmospheric testing, as the Administration has indicated, levels will rise even higher.

Once strontium-90 is lodged either in man or internally in plants, it is virtually impossible to remove. But, fortunately, since most of the contamination settles on the surface of the plants, thorough washing of leafy vegetables and peeling pulpy types substantially cuts down the strontium-90 content. Washing spinach, for example, will reduce the strontium-90 content by 60%. Virtually all of it can be eliminated from potatoes, apples and peaches by peeling even though the peels are richer in nutrients than the inner segments.

Apples and similar fruit also should be cored, since the cores have even higher strontium content than the peels. Thus applesauce, prepared from peeled and cored apples, though less nutritious, will have substantially less contaminating radiation.

The high nutrient value of whole grain cereals makes them particularly desirable as a food for growing children, pregnant women and nursing mothers. However, their strontium content is extremely high, many times higher per pound than any other plant food, except tea. Refining and processing the whole grains, while cutting down food values, can reduce radiation contamination as much as eight times, according to FDA studies.

Milk which is rich in calcium is also high in strontium-90. This is because the hay, alfalfa and food grains upon which cows feed have such heavy concentrations of this isotope. A process has been developed by the Atomic Energy Commission, the PHS and the Department of Agriculture which can remove strontium-90 from milk. In the event of a sharp rise in radiation levels, as may be anticipated, strontium-90 removal plants probably will be established by the dairy industry with Federal aid.

Of all foods, tree-borne fruits appear to have the least strontium-90, particularly those with smooth skins. Strontium-90 particles have less tendency to cling to smooth surfaces. Fruits protected by heavy inedible skins, such as bananas and nuts, are virtually free of strontium contamination.

Tea has the highest strontium-90 content of any food. According to the December, 1961, Radiological Health Data published by the PHS, tea from Japan, Pakistan and India, harvested during the moratorium on nuclear testing in 1958 and 1959, had levels of strontium-90 as high as 800 micro microcuries per pound. The daily limit of strontium-90 set by the International Commission on Radiation Protection is 33 micro microcuries from all sources.

Yet people on Taiwan in Formosa have been advised by authorities there to eat tea leaves under the mistaken assumption that their oxalic acid content absorbs radioactive substances. Chewing Asian tea leaves in any substantial amount would be a hazard to health. Fortunately for the world's tea drinkers, however, the hazard is substantially reduced by brewing. About 20% of the contamination is carried over in the beverage. Soluble teas contain even lower concentrations of strontium-90—as little as one-twentieth of the amount in the leaves, according to the PHS.

Teas from Africa and South America contain one-fourth to one-fifth as much strontium contamination, showing how geography is also a factor in determining fallout levels. The amount of fallout ingested by man depends, therefore, not only on what he eats but where it is grown and where he lives.

FOOD RADIOANALYSIS—Howard M. Bollinger, supervising chemist, surveillance section, radioactivity branch of the U. S. Food and Drug Administration, checks staple foods that have high strontium-90 concentrations.

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The PHS insists that at current levels of fallout in the United States there is no danger in maintaining present eating habits. However, the expected increase in fallout next spring from the Soviet bomb tests certainly warrants some revision in diet, particularly for children, so that foods with lower levels of strontium-90 are predominant.

The amount of fallout in some foods had been steadily increasing even before the recent Russian tests, the 1960 AEC annual report stated. A PHS spokesman pointed out that as atomic energy becomes more widely used as a source of power, "fallout" from these sources will add substantially to the burden of contamination in foods.

Government scientists are trying to find a way to keep atomic dangers at a minimum consistent with good health and safety. Meanwhile, however, thorough washing of all foods, peeling vegetables, boning meat before cooking, and being more selective in diet are the only remedies that can be exercised by the public.

As part of its monitoring program, the AEC is conducting a tri-city study of strontium-90 in average daily diets. The cities under study by the AEC are San Francisco, Chicago and New York. Selected foods representing the total average annual consumption of an individual, were purchased in each of these cities at three-month intervals and then analyzed for strontium-90 and stable calcium to determine the strontium to calcium ratio. The studies show that radiation levels are highest in New York and lowest in San Francisco, confirming that the rate of fallout is greater in the northeastern part of the United States. The total amount of strontium-90 intake estimated on an annual basis is three times higher in New York than in San Francisco.

The strontium-90 to calcium ratio of an average New York diet in 1959 was 17 strontium units. The Federal Radiation Council has set .5 rem as the annual maximum permissible limit of radiation exposure from all non-medical man-made sources for the general population. According to FRC estimates, the body discriminates against strontium-90 by a factor of four. This would mean an "average" annual exposure, measured in rems, of a little over .01. Actual uptake depends on the body's calcium control.

While this would be well within the limits, it must be remembered that strontium-90 is only one of many elements of man-made radiation. It is possible that the total present dosage in certain areas and for some individuals exceeds the .5 rem limit. Also, the "averages" as estimated by the Federal Radiation Council are not scientifically realistic estimates. At best they may be termed scientific "guesstimates," since there is nothing average about fallout, either in its distribution or its uptake by earth, plants or man.

Although the U. S. Government recognizes the dangers of radiation, there has been little or no evident planning here to handle a situation if wheat or milk, for example, reached dangerous high contamination levels from bomb test fallout.

Great Britain has set aside powdered milk for such emergency use. This has not been done here, nor is such action contemplated, a PHS spokesman told Science Service. Yet if an emergency did occur it would take months to set up enough plants to remove strontium from milk. It has been suggested that storable staple surplus food commodities be set aside in the event of any local or national emergency resulting from excessive fallout. Stockpiling of all foods by canning or freezing could be done locally under Federal and state sponsorship, and a system of rationing developed. Meanwhile, it might be helpful to publish weekly estimates of radiation levels in foods so that the housewife could plan a diet that will not impose too great a risk from radiation. Canned and processed foods are now labeled for food additive contents. It should be possible to include estimated radiation levels.

While these and other projects have been discussed, no program has been decided upon. For the health of the nation, since a nuclear test ban now seems remote, a decision must be made soon.

Units for Measuring Radiation

curie—The radioactivity of one gram of radium is a curie.

micro microcurie or picocurie—One millionth of a millionth of a curie.

roentgen—A unit of radiation dose. Exposure to a wristwatch dial containing one millionth of a curie of radium, at a foot distance from the body, results in a body exposure of about 10 millionths of a roentgen per hour.

rem—(roentgen equivalent man), the radiation exposure dose for man which specifically expresses the radiation absorbed by human tissue.

strontium unit—(SU), one micro microcurie of strontium-90 per gram of calcium. According to the biology and medicine division of the Atomic Energy Commission, one SU is equal to 3 millirem or .003 rem. The equivalent in rem for any element varies with its energy absorption per gram of body tissue.

Radiation Protection Guides (RPG)—These are limits, measured in rems, set by the Federal Radiation Council, for certain body organs as well as for whole body exposures to ionizing radiation. They have been approved by the President.

RPG for General Population:
Thyroid—.5 rem per year
Bone marrow—.17 rem per year
Bone—.5 rem per year
Total body—.5 rem per year

Range limits set by FRC for daily intake of radionuclides in micro microcuries per day. Above limits for Range II, action is necessary to protect the public.

	Range I	*Range II*	*Range III*
Radium-226 (affects bone and marrow)	0-2	2-20	20-200
Iodine-131 (affects thyroid)	0-10	10-100	100-1000
Strontium-90 (affects bone and marrow)	0-20	20-200	200-2000
Strontium-89 (affects bone and marrow)	0-200	200-2000	2000-20,000

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GENERAL SCIENCE

Science Integrated Into Society Since W.W. II

➤ THE SIGNIFICANT integration of science into society in the years since World War II was discussed by Dr. Glenn T. Seaborg, Nobelist and chairman of the Atomic Energy Commission, who delivered the John Wesley Powell lecture of the American Association for the Advancement of Science at Denver, Colo.

"The entry of scientists," he said, "into important national advisory capacities is the inevitable concomitant of the events of the past twenty years. It does not seem to me that the influence of scientists in this respect is greater than it should be; indeed, in the national interest, it must increase."

The greatest problem of a democratic people adjusting to this new condition is that of assimilation and understanding of the new decisive role of science.

"In the past two decades, our democracy has ingested science, but has not digested it." Fundamental in this assimilation, Dr. Seaborg believes, is bridging the present gap between two hostile groups of individuals—the literary and the scientific. "The philosopher, the social scientist, the artist, the writer, the natural scientist, all are intellectual brothers under the skin." There must be a "working realization of the common heritage of truth-seekers—among scientists as well as other intellectuals."

Dr. Seaborg made it plain that he did not consider this "new kind of society as the property of science. We cannot proceed intelligently without integrating into our thinking and our acting the full range of human wisdom."

Most important in accelerating the process of assimilation of science is the expansion and raising of the level of education all along the line. "We must search out and cultivate the gifted and creative," he said. "We must mine every vein of our human resources."

Concerning the future, he asked "Can the democratic-scientific society combine the values of freedom and individual worth with the promise of growing material well-being, not only for ourselves but as a choice for other peoples?

"I believe we can and will, partly because of the moral strength of freedom and partly because of material power of our new society."

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Stutterers as Orators

➤ STUTTERERS in their mind's eye see themselves as great orators, their drawings made as part of a remedial psychological study reveal.

Prof. Joseph A. Fitzpatrick of the University of Denver reported to the American Association for the Advancement of Science in Denver, Colo., that the image that stammerers and stutterers have of the "ideal speaker" is not any great orator, past or present, but of themselves projected into the role.

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