NYO-4753(Suppl. 3)

HEALTH AND SAFETY

19627

UNITED STATES ATOMIC ENERGY COMMISSION

ANNOTATED BIBLIOGRAPHY ON LONG RANGE EFFECTS OF FALLOUT FROM NUCLEAR EXPLOSIONS

By
Allen G Hoard

October 1958

New York Operations Office
New York, New York

Technical Information Service Extension, Oak Ridge, Tenn.

1. Alba, A. Fernando; Brody, T. A.; Lezama, H.; Tejera, A.; and Vasquez, Barete M. SECOND REPORT ON RADIOACTIVE PRECIPITATION. Revista Mexicana de Fisica 6, 97-104 (1957) (In Spanish).

Data on radioactive precipitation obtained during the period from September, 1956, to February, 1957 using the methods described in the previous report are presented.

2. Amano, Keishi; Tozawa, Harumi; and Takase, Akira. RADIOACTIVITY IN CERTAIN PELAGIC FISH. IV. SEPARATION AND CONFIRMATION OF RADIOIRON IN SKIPJACK. Nippon Suisangaku Kaishi 21, 1261-8 (1955-56).

Incinerated liver (0.2g.) and stomach (0.15g.) of a skipjack caught near the Bikini Atoll on June 19, 1954, were dissolved in 0.2N HCl, filtered, and the filtrates made up to 100 cc.; the radioactivities were 130 and 86 counts/min./cc., respectively. The solutions were passed through column of Dowex 50. Elution with 0.5% oxalic acid gave powerful radioactivity with liver, but very weak with stomach. Elution with a solution of NH_4 citrate at pH 3.5 from both samples showed strong radioactivity, probably due to the presence of Zn^{65}. Distinct radioactivity was also detected in the NH_4 citrate eluate at pH 4.1 from the liver, but not from the stomach; this eluted element emitted no γ-rays and differed from Zn^{65}. The elution behavior of the radioactive element in the 0.5% oxalic acid elution showed that it was Fe; elution by 0.6M HCl after adsorption to Dowex 1 supported this result. Zr^{95} and Nb^{95} were indicated from these data to be absent. The pulse height distribution curve of γ-ray emitted by the element also indicated that it was Fe. However, the radiation decay curve differed considerably from that of Fe^{59}, suggesting the presence of radioactive element with longer half-life. Comparison of the absorption coefficient of Al, Ag, and Au for x-rays from Fe^{55}, Ni^{63} and the isolated element indicated that the element was Fe^{55}.

3. Anderson, E. C.; Schuch, R. L.; Fisher, W. R.; and Van Dilla, M. A. BARIUM-140 RADIOACTIVITY IN FOODS. Science 127, 283-4 (1958).

Ba^{140} was observed in deer and cattle in the summer of 1956, presumably the result of nuclear tests. However, no commercial beef was found to be contaminated. In the months of June, July, and August of 1957 the isotope appeared in milk samples in the United States. The dates and concentrations of Ba^{140} in powdered milk is summarized for those locations at which the Ba^{140} γ activity exceeded that of natural K^{40}.

4. Aron, Arthur
ABSORPTION CURVE OF FALLOUT PRODUCTS. Anais da Academia Brasileira de Ciencias 28, 423-5 (1956) (In English).

5. Aron, Arthur; and Gross, Bernhard
RADIOACTIVITY OF AIR CAUSED BY NUCLEAR BOMB TESTS. Zeitschrift fur Naturforschung 12a, 944-5 (1957)

Daily checks of radioactive fallout at the above institute (Instituto Nacional de Tecnologia, Rio de Janeiro) gave an activity 10 times as high as the average on June 25, 1957. By applying the decay law for fallout of Way and Wigner the origin could be traced to the British H-bomb test at Christmas Island on May 15, 1957. By autoradiography of the filter it was shown that the high activity was caused by only one highly radioactive particle.

6. Bechert, K.
THEORY OF RADIOACTIVE POISONING BY MILITARY ATOMIC TESTS. Atomkern-Energie 3, 64-8 (1958) (In German).

The poisoning which occurs during the continuation of atomic tests is distinguished from that occurring later. The earth and body poisoning and the quantity of radiation causing poisoning of critical organs are calculated. The calculation is simplified by the assumption that during the tests the fallout is continuous. With unlimited continuation of atomic tests, earth and body poisoning approach a stable limiting value, which depends on the amount of the fallout. After discontinuance of the tests, the earth and body poisoning first rises to its highest value and then sinks. Application of the equations to the question of Sr90 poisoning gives complete authorization for warnings about continuation of atomic tests.

7. Bell, Carlos G.
NUCLEAR LONG-RANGE FALLOUT IN SURFACE WATERS. Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers 83, 1400-1-21 (1957).

Based in part on samples from the National Bureau of Standards, rather extensive calibration measurements indicated a fallout beta (disintegrations) / (count rate) ratio of 2.8 $\mu\mu$ curies per count per minute for the water samples. The average of the most radioactive set of surface water samples collected in eastern Massachusetts following November, 1952, Eniwetok detonations registered 6.9 counts per minute per liter or 0.02 $\mu\mu$ curies per milliliter. (Cont'd)

7. Bell, Carlos G.
NUCLEAR LONGE-RANGE FALLOUT IN SURFACE WATERS. (Cont'd.)

As the peak radioactivity concentration in rain and surface waters occurred about a month after these tests, the Atomic Energy Commission - Civil Defense Administration beta concentration level for 30 day water consumption appears pertinent. This indicates that for drinking water purposes, the Ivy test would have had to discharge (31,000 μ μ curies per milliliter) / (0.02 μ μ curies per milliliter) = 1,500,000 times as much fission radioactivity to reach the above mentioned level in eastern Massachusetts.

8. Bergh, H.; Finstad, G.; Lund, L.; Michelsen, O.; and Ottar, B. RADIOCHEMICAL ANALYSIS OF FALLOUT IN NORWAY. Monthly Communication No. 1. May 1957. 8p. Norwegian Defence Research Establishment, Oslo. (In English).

Data are tabulated on the concentration of radioactive iodine and strontium in samples of milk, and radioactive strontium and cesium in samples of drinking water collected in Norway, January to May 1957.

9. Bergh, H.; Finstad, G.; Lund, L.; Michelsen, O.; and Ottar, B. RADIOCHEMICAL ANALYSIS OF FALLOUT IN NORWAY. Monthly Communication No. 2. June 1957. 9p. Norwegian Defence Research Establishment, Oslo. (In English).

Data are tabulated on the concentration of radioactive iodine and strontium in samples of milk, radioactive strontium and cesium in samples of drinking water, and radioactive strontium in tea and coffee preparations collected in Norway during May 1957.

10. Bergh, H.; Finstad, G.; Lund, L.; Michelsen, O.; and Ottar, B. RADIOCHEMICAL ANALYSIS OF FALLOUT IN NORWAY. Monthly Communication No. 3. July 1957. 7p. Norwegian Defence Research Establishment, Oslo. (In English).

Data are tabulated on the concentration of radioactive iodine, strontium, and cesium in samples of milk and radioactive strontium and cesium in samples of drinking water collected in Norway during June 1957.

16. Bryant, F. J.; Chamberlain, A. C.; Morgan, A.; and Spicer, G. S. RADIOSTRONTIUM IN SOIL, GRASS, MILK AND BONE IN THE UNITED KINGDOM; 1956 RESULTS. _Journ of Nuclear Energy 6_, 22-40 (1957).

The results of Sr-90 analysis of soil, grass and sheep bone from twelve stations in England and Wales are given. The Sr-90 in the top 4 inches of undisturbed soil in July 1956 ranged from 1.9 to 10.0 mc/km^2, depending on the rainfall. The Sr-90 activity of herbage and of sheep bone showed a wider range, samples from acid hill soils being relatively more active. Milk from Somerset had a median activity of 4.4 μμc Sr-90/g Ca in 1956, compared with 4.1 in 1955. Human-bone specimens obtained in 1956 showed Sr-90 activity depending on age. The average level in children under 5 was 0.7 μμc Sr-90/g Ca and the average bone dose 2 mrad/year.

17. Comar, C. L.; Wasserman, R. H.; and Russell, R. Scott. STRONTIUM-CALCIUM MOVEMENT FROM SOIL TO MAN. _Science 126_, 485-92 (1957).

Radiostrontium moves similary to calcium in food chains, is well absorbed by plants, animals, and man; is deposited and retained in bones; is transmitted to milk and to the developing fetus; and is known to cause bone tumors and is suspected of causing leukemia. Megaton nuclear explosions result in a large fraction of Sr-90 formed being deposited in the stratosphere. This material slowly passes back into the troposphere with an average residence in the stratosphere of about 10 years. Kiloton weapons deposit their Sr-90 in the troposphere. Radioactivity in the troposphere, regardless of origin, is relatively quickly deposited on the surface of the earth, primarily by precipitation. The comparative movement of Sr and Ca in biological systems is discussed. Finding related to the differential behavior of the two elements are reviewed.

18. Commoner, Barry
THE FALLOUT PROBLEM. _Science 127_, 1023-26 (1958).

19. Conard, Robert A.; Huggins, Charles E.; Cannon, Bradford; and Lowrey, Austen. MEDICAL SURVEY OF MARSHALLESE TWO YEARS AFTER EXPOSURE TO FALLOUT RADIATION. Journal of The American Medical Association 164, 1192-97 (1957).

This report concerns the medical follow-up survey of 82 Marshallese people two years after exposure to fallout radiation. On Rongelap Island, 64 people and on Ailingnae, 18 people were exposed to the radiation on March 1, 1954, after an experimental detonation of a nuclear device some 100 miles away. Initial and follow up studies on these people six months and one year after exposure have been reported.

20. Dunning, Gordon M.
CRITERIA FOR ESTABLISHING SHORT TERM PERMISSIBLE INGESTION OF FALLOUT MATERIAL. Journal of the American Industrial Hygiene Association 19, 111-120 (1957).

The criteria for establishing permissible ingestion of radioactive fallout material under emergency conditions for several weeks following a nuclear detonation are dependent primarily on exposures (1) to the gastronintestinal tract from the gross fission product activity, (2) to the thyroid from the isotopes of iodine, and (3) to bone, principally from strontium-90-yttrium-90, strontium-89, and barium-140-lanthanum-140. Data on these effects are presented and their biological significance is discussed. Some of the possible effects are summarized in a table and discussed in terms of permissible intake. Rules are suggested by which the least contaminated foods are used first, and preference in their use is given to children. If the degree of contamination of an area is such that the external gamma exposure would permit normal and continuous occupancy after a fallout, the internal hazard would not deny it.

21. Dunning, Gordon M.
FORMATION OF RADIOACTIVE PARTICLES. 16p.

Paper presented at the Society of Nuclear Medicine, Salt Lake City, Utah, June 22, 1956.

22. Dunning, Gordon M.
IMMEDIATE RADIATIONS FROM NUCLEAR DETONATIONS. *Journal of the Washington Academy of Sciences* 47, 189-95 (1957).

Temperature pulsations within a fireball, as it advances vertically and horizonatally, ranges from several million degrees at the time of detonation, decreases markedly within a fraction of a second and rises again to near maximum; continuing then to drop off with time. Time sequence of the temperature pulse is dependent upon the yield (energy) value of the blast. a function of the size of the fireball. A 20-kiloton burst (20,000 tons TNT equivalent) will create a fireball of about 600 feet in radius. Other size detonations can be determined by the relation: R/RO = (W/WO)2/5, where RO - maximum radius of reference burst, WO = yield of reference burst. Rate of delivery for a given total thermal energy is relatively fast for lower yield bursts, but is is appreciably slower for higher yield detonations, suggesting the possibility of effective action for the larger burst. The total energy (thermal) reaching a given point is a function of: yield, distance from burst, and state of the atmosphere. Effectiveness of evasive action and the use of shielding materials for protection from thermal radiations causing 1st-, 2nd-, and 3rd-degree burns as well as estimations for γ-exposure expressed in r. and r. equivalent man (REM) are tabulated and correlated to burst yield from 20-20,000 kilotons in approximate distance of 30, 300, and 1,000 miles from point of detonation.

23. Dunning, Gordon M. (Division of Biology and Medicine, U. S. Atomic Energy Commission, Washington, D. C.). RADIATIONS FROM FALLOUT AND THEIR EFFECTS. 48p. (1957).

24. Dunning, Gordon M.
RADIOACTIVE CONTAMINATION OF CERTAIN AREAS IN THE PACIFIC OCEAN FROM NUCLEAR TEST. 60p. Washington, U. S. Government Printing Office, 1957. $0.40. Y3.At7:2R11/20.

The results of the medical and radiological surveys of the Marshall Islands following the thermonuclear test at Eniwetok, March 1, 1954, are presented. In addition to an external gamma radiation survey, the gross activity of land plants, marine organisms and birds, soils, and water was measured. The results of radiochemical analyses of various biological materials are given, and studies of internal contamination of animals, residual activity in the Pacific Ocean, and medical status of the Rongelapese are described.

25. Dwyer, L. J.; Keam, D. W.; Stevens, D. J.; and Titterton, E. W. SEARCH FOR FALLOUT IN AUSTRALIA FROM THE CHRISTMAS ISLAND TESTS. Australian Journal of Science 20, 39-41 (1957).

26. Eckelmann, W. R.; Kulp, J. L.; and Schulert, A. R. STRONTIUM-90 IN MAN, II. Science 127, 266-74 (1958).

Further investigation of strontium-90 in man is reported, with much detailed information. For any given locality, the Sr-90 content of adult bone is independent of age. Regional differences are much smaller than the differences in total fallout. The average concentration of strontium-90 in the skeleton of North American and European children was about 0.7 micromicrocuries of strontium-90 per gram of calcium, whereas that for adults it was about one-tenth that figure. Increase in the strontium-90 content of the diet follows that of the total integrated fallout, but the level in bones lags behind, because of delay in reaching equilibrium. If there were no further atomic tests after mid-1957, children in the northeastern United States would reach a peak level of 2.9 micromicrocuries of strontium-90 per gram of calcium. If testing continues at a rate that a certain region receives 10 millicuries per square mile per year (the rate in northeastern United States in 1956-57) the equilibrium bone level for the population will be 21 micromicrocuries of strontium-90 per gram of calcium.

27. Egawa, Tomoji
SUMMARY OF "EFFECT OF HYDROGEN BOMB EXPLOSION ON THE RICE AND VEGETABLES". Kagaku Asahi 2p. (1954).

28. Eisenbud, Merril
GLOBAL DISTRIBUTION OF RADIOACTIVITY FROM NUCLEAR DETONATIONS, WITH SPECIAL REFERENCE TO STRONTIUM. Journal of the Washington Academy of Sciences 47, 180-8 (1957).

Global studies of Sr^{90} under Project Sunshine by monitoring and collection techniques for documenting local and intermediate radioactive fallout from the troposphere and tropopause meterologically distributed are detailed and correlated with global soil measurements of Sr^{90}. Confirmed Sr^{90} reserve in the stratosphere is estimated by computation of the integrated dosage from the detonation less local and global deposition. Since the half-life of Sr^{90} is 28 years and the mean residence time in the stratosphere is some time less, radioactive decay of Sr^{90} is not employed in estimating the subsequent uniform deposition of the earth's surface. (cont'd.)

28. Eisenbud, Merril
GLOBAL DISTRIBUTION OF RADIOACTIVITY FROM NUCLEAR DETONATIONS, WITH SPECIAL REFERENCE TO STRONTIUM. (cont'd.)

The probable average level of world-wide contamination by Sr^{90}, when all of Sr^{90} produced to date has been deposited, may be approximately 20 mc per square mile. Presence of this isotope in soil is significant only because it is potentially available for assimilation by plants, animals, and ultimately man. Increase of Sr^{90} contamination in milk studied in the metropolitan New York milkshed is proportionally relative to cumulative Sr^{90} contamination in the soil of this study area. Maximum forseeable assimilation of Sr^{90} in the human skeleton is estimated to be about 2.3 r.e.p. in life expectancy of 70 years. Natural limits of K^{40} and C^{14} cosmic rays, terrestrial γ-radiation, and natural Ra is compared at 7-30 r.e.p. for the same life span.

29. Failla, G.
STATEMENT ON RADIOACTIVE FALLOUT. ADVISORY COMMITTEE ON BIOLOGY AND MEDICINE. <u>American Scientist</u> <u>46</u>, 138-50 (1958).

The radioactive fallout problem is discussed in detail with references to the report of the Committee on the Biological Effects of Atomic Radiation of the National Academy of Sciences. The discussion includes: the accumulation of strontium-90 in soil, milk, and human bones, its possible damage in the forms of genetic damage, leukemia, and bone tumors; and the recommended upper limit of 10 r in 30 years for the genetic dose to the population of the United States. Although the dose from nuclear explosions is small in relation to the total radiation from other sources, the estimate of ultimate damage to the world's present and future population is large enough to cause concern by the public. In terms of national security, necessary tests of nuclear weapons are justified; however, in view of the adverse repercussions caused by these tests, the Committee recommends that tests be held to a minimum consistent with scientific and military requirements and that appropriate steps be taken to correct the present status of confusion on the part of the public.

30. Farlow, N. H.; Schell, W. R.; and Adams, C. E. NATURE OF RADIOACTIVE FALLOUT PARTICLES. Paper presented at American Chemical Society, 132nd Meeting, New York, September 8-13, 1957.

The chemical composition, structure, and mode of origin of several different types of radioactive fallout particles have been determined using petrographic techniques, reagent films, and x-ray diffraction analysis. The fallout particles studied were collected following the detonation of nuclear weapons under various conditions at both the Nevada Test Site and the Eniwetok Proving Ground. Radioactive fallout particles were formed by the interaction of the condensing vaporized metals and fission products derived from the bomb and associated structures with the surface material swept up into the cooling fireball. Descriptions of the various types of fallout particles are given and their modes of origin are qualitatively related by a simplified thermodynamic treatment.

31. Franzen, L. F.; Myszynski, G.; and Wiesenack, G. DOSES OF RADIATION FROM NATURAL AND ARTIFICIAL RADIOACTIVE SOURCES. Atomwirtschaft, Die 2, 362-6 (1957). (In German).

Only since quite recently has man been subjected to irradiation which, as the result of medical and industrial development has been added to the radiation from natural sources. According to the investigations quoted artificial radiation accounts for 20 to 25 per cent of the total radiation level. Atomic test explosions have so far only made an insignificant contribution. The same can still be said of the industrial application of nuclear energy which is still in its infancy. It has been estimated that people living in Europe will over a period of 30 years be subjected to a total dose of radiation from 2,500 to 4,000 mr. Of this total dose received in 30 years about 750 to 850 mr will be contributed by medical and industrial appurtenances, the overwhelming share of 600 to 700 mr being the result of medical x-ray diagnosis. The atmospheric radioactivity has been estimated (incl. rainfall etc.) at 20 to 30 mr over a period of 30 years and will therefore not represent any hazards as far as external, direct radiation is concerned. The possible absorption by and accumulation of radiation substances in the body must, however, be carefully studied and special consideration must be given to fission products with a long half-life.

32. Garrigue, Hubert
RADIOACTIVITY IN THE AIR AND IN PRECIPITATION. Comptes Rendus 243, 584-5 (1956).

Since May 31, 1956 (up to July 18) all precipitation at the Puy-de-Dome summit has been polluted with radioactive fission products. This is confirmed by a sampling in flight on June 15.

33. Gedeonov, L. I.
RADIOACTIVE CONTAMINATION OF THE ATMOSPHERE. Soviet Journal of Atomic Energy 2, 313-25 (1957) (English Translation); Atomnaya Energy 2, 260-71

A review of foreign papers is presented on the study of radioactive contamination of the atmosphere, which is due primarily to diffusion of fission fragments from atomic tests. 75 references.

34. Gerlach, Walter; Zeising, Ilse; and Stierstadt, Klaus
INVESTIGATION OF RADIOACTIVE FALLOUT. Atomkern Energie 2, 438-43 (1957) (In German).

An investigation was made to the amount of radioactive fallout present in rain, snow, dew, hoarfrost, etc., at various places for various months of the years 1956-57).

35. Glass, Bently
THE GENETIC HAZARDS OF NUCLEAR RADIATION. Science 126, 241-6 (1957).

Present concepts of the nature of mutations are reviewed. The role of radiation in inducing permanent alterations of hereditary material and the nature of these changes are discussed.

36. Greenfield, S. M.
RAIN SCAVENGING OF RADIOACTIVE PARTICULATE MATTER FROM THE ATOMSPHERE. Journal of Meteorology 14, 115-25 (1957).

37. Herbst, W.; and Sommermeyer, K.
γ-SPECTRA OF RADIOACTIVE FALLOUT FROM THE ATMOSPHERE. Naturwissenschaften 44, 392 (1957) (In German)

Foils used for collecting dust which were exposed to radioactive fallout for 8 days, and grass ashes exhibit the same γ-spectra. The peaks were characteristic of the following isotopes, half-lives in brackets: Ba^{140} (13 days) + La^{140}; Zr^{95} (65 days) + Nb^{95}; and Ru^{103} (40 days). Relative peak heights indicated age of fallout.

38. Hiyama, Yoshio
FROM THE BIKINI INCIDENT TO THE US-JAPAN RADIATION CONFERENCE. Japanese Scientific Monthly 7, 2-9 (1955).

39. Hiyama, Yoshio
AN ENUMERATION OF FUTURE SR^{90} CONCENTRATION IN FOODS AND BONE. Japanese Scientific Monthly 10, 1-6 (1958).

40. Hiyama, Yoshio
MAXIMUM PERMISSIBLE CONCENTRATION OF SR^{90} IN FOOD AND ITS ENVIRONMENT. Records of Oceanographic Works in Japan 3, 70-77 (1957).

41. Hiyama, Yoshio
MEASURE OF FUTURE SR^{90} LEVEL FROM EARTH SURFACE TO HUMAN BONE. Japanese Scientific Monthly 10, 1-17 (1957).

42. Hiyama, Yoshio; and Ichikawa, Ryushi
MEASURE ON LEVEL OF STRONTIUM 90 CONCENTRATION IN SEA WATER AROUND JAPAN, AT THE END OF 1956. Records of Oceanographic Works in Japan 4, 49-54 (1957).

43. Hiyama, Yoshio
RADIOLOGICAL DATA IN JAPAN II. CONCENTRATIONS OF SR^{90}, CS^{137}, PU^{239}, AND OTHERS IN VARIOUS MATERIALS ON EARTH'S SURFACE. Japanese Scientific Monthly 10, (1957).

44. Hiyama, Yoshio; and Ichikawa, Ryushi
UP-TAKE OF STRONTIUM BY MARINE FISH FROM THE ENVIRONMENT. Records of Oceanographic Works in Japan 3, 78-84 (1957).

45. Hiyama, Yoshio
AMOUNT OF UP-TAKE OF STRONTIUM BY MARINE FISH FROM THE ENVIRONMENT OF VARIOUS CONCENTRATION OF CALCIUM AND STRONTIUM. Records of Oceanographic Works in Japan 4, 55-66 (1957).

46. Inglis, D. R.
FUTURE RADIATION DOSAGE FROM WEAPON TESTS. Science 127, 1222-1227 (1958).

47. Jurkiewicz, L.
RADIOACTIVE CONTAMINATION OF THE ATMOSPHERE BY THE FALL-OUT FROM NUCLEAR EXPLOSIONS. Nucleonika 2, 657-666 (1957) (In Polish).

Fresh traces of radioactive contamination from U^{235} and Pu^{239} have been found, and the effects from the nuclear and thermonuclear explosions are discussed.

47. Jurkiewicz, L.
RADIOACTIVE CONTAMINATION OF THE ATMOSPHERE BY THE FALL-OUT FROM NUCLEAR EXPLOSIONS. (cont'd.)

Tables showing the recent data on the dose of ionizing radiation received by man in various conditions are presented, and the extreme importance of systematic monitoring of radioactivity in the atmosphere is stressed.

48. Kegel, Gunter
MEASUREMENTS OF LONG-RANGE FALLOUT IN RIO DE JANEIRO. Anais da Academia Brasileira de Ciencias 28, 447-453 (1956) (In English).

49. Langham, Wright H.; and Anderson, Ernest C.
STRONTIUM-90 AND SKELETAL FORMATION. Science 126, 205-6 (1957).

The potential radiostrontium level to be expected in the skeletons of growing children as a result of environmental contamination was computed. Results are based on available data on the rate of bone remodeling and exchange, the rate of skeletal growth, and the level of Sr^{90} in the biosphere.

50. Lebedinskii, A. V.
ON THE CONSEQUENCES OF RADIOACTIVE SR^{90} FALLOUT. Medical Radiology 2, 22-33 (1957) (In Russian).

51. Libby, Willard F.
DISTRIBUTION AND EFFECTS OF FALLOUT. Bulletin of the Atomic Scientists 14, 27-30 (1958).

52. Libby, W. F.
FALLOUT HELPS WEATHER STUDIES. Atomics and Nuclear Energy 9, 236-7 and 245 (1958).

53. Libby, Willard F.
RADIOACTIVE FALLOUT. 30p.

Remarks prepared by Dr. Willard F. Libby, Commissioner, U. S. Atomic Energy Commission for delivery before the Swiss Academy of Medical Sciences Symposium on radioactive fallout, Lausanne, Switzerland, March 27, 1958.

9. Libby, Willard F.
RADIOACTIVE FALLOUT. <u>Proceedings of the National Academy of Sciences</u> 43, 758-775 (1957)

Three types of fallout are local, tropospheric (2-3 weeks), and stratospheric (10 years). Fallout dissemination is dependent upon firing conditions, i. e., whether there is surface contact, the type of surface, the height of the fireball, and the size of the weapon. Fission products from a small bomb fired in Nevada would fall in latitudes 10-60° N in about 1 month, while those from a large bomb would fallout over the whole earth in about 10 years. About the same amounts of radio-Sr and radio-Cs are produced. Radio-Cs data show the fallout dissemination mechanism and point the way to Sr-90 behavior. Radio-Cs fallout, except of a local variety, is carried down largely in the form of moisture droplets. There is some pickup by leaves and grass on surfaces. Some is captured and held tightly by the top 2 inches of most soils so the water going into rivers is purified. Because of discrimination factors against Sr-90 relative to Ca from soil to leaves (about 1.4), from leaves to milk (about 7), and from milk to the human body (about from 2 to 8), the concentration of radio-Sr derived from milk vs. Ca in human bone, is not over 1/20 and, possibly, as little as 1/80 of that in topsoil. Since a considerable portion of fallout may be picked up directly by leaves, the factor 1.4 does not apply in this case, and the total protection factor may be reduced to 14. The high availability of Ca in topsoil reduces Sr pickup by plants. The maximum permissible concentration of Sr-90 for occupational workers and the general population has been set at 1 and 0.1 μc., respective. The value 100 micromicrocuries of Sr-90 per g. of body Ca is called 100 Sunshine Units (S.U.). At present, adults have about 0.1 - 0.2 S.U. and children about 0.5 S.U. The difference in annual cosmic-ray radiation dosage between sea level and 5,000 feet altitude is equal to 8 S.U. Data show no correlation between this radiation level and leukemia or bone cancer. One μc (1,000 S.U.) is considered to be safe. Factors, other than Sr-90 effect, are general γ-radiation effect, mainly from fission products in local fallout area, or tropospheric fallout. The general average intensity of fallout γ-radiation from tests is 1-5 mr. A brick house can produce as much as 25-50 mr./year more than a wooden one. Dosages received are about 1/100,000 of the amount necessary to give injury symptoms (100-200 r.). Genetics effects are in doubt.

55. Lockhart, L. B.; Baus, R. A.; and Blifford, I. H. ATMOSPHERIC RADIOACTIVITY ALONG THE 80th MERIDIAN, 1956. U. S. Naval Research Laboratory. July, 1957. 15 p. Washington, Office of Technical Services. $0.50. PB131081.

Measurements of atmospheric radioactivity and fallout at a number of sites along the 80th meridian (west) are reported for the year 1956. These results were obtained through the combined efforts of the U. S. Naval Research Laboratory and the Meteorological Services of Chile, Peru, and Ecuador with the cooperation of the U. S. Weather Bureau and the U. S. Atomic Energy Commission. Radioactivity levels at the various sites during 1956 are reported for three different collecting systems: air filters, cloth screens, and gummed films. Extremely wide variations in the gross radioactivity of fission products in the air have been noted, with highest levels occurring in the Northern Hemisphere. The presence of some of the peaks of activity at various localities has been correlated with known atomic explosions.

56. Lockhart, Luther B. RADIOISOTOPES ON YOUR ROOFTOP. <u>Journal of Chemical Education</u> 34, 602 (1957).

Rain H_2O and dry fallout were collected during a 2-week period by using a plywood platform (8 feet square) covered with 4-milpolyethylene (I). The material was passed over a column consisting of a 1-inch band of filter paper pulp, a 2-inch band of cation-exchange resin, and a 1-inch band of anion-exchange resin in a piece of 1-inch (internal diameter) I tubine. Less than 2 per cent of the gross β-activity passed through the column. The contents of the column were dried, ignited at 650^o, and the ash was analyzed radiochemically. Values for activity (disintergrations/min., d./m.) and rate of deposition (d./m sq.ft./day and atoms/sq.ft./day, resp.) were, resp.: Ba^{140}, 11,600, 13, 3.5×10^5; Ce^{141}, 21,600, 24, 1.4×10^6; Sr^{89}, 7,000, 8, 8.7×10^5; Y^{91}, 22,000, 25, 2.9×10^6; Ce^{144}, 11,600, 13, 7.4×10^6; Sr^{90}, 890, 1, 2.1×10^7; Cs^{137}, 1,900, 2, 6.0×10^7; Bi^{210}, 990, 1, 2×10^7.

57. Lough, S. Allan
RADIOACTIVE FALLOUT.

Remarks by Dr. S. Allan Lough, Director, Health and Safety Laboratory, New York Operations Office, U. S. Atomic Energy Commission, before the All-College Convocation and Atomic Energy, State University of New York, Teachers College, Fredonia, New York - March 13, 1958.

58. Lough, S. Allan
STRONTIUM 90 MEASUREMENT IN FOODS. Journal of Milk and Food Technology 21, 5-6 (1958).

Remarks by Dr. S. Allan Lough, Director, Health and Safety Laboratory, New York Operations Office, U. S. Atomic Energy Commission, before the 44th Annual Meeting of the International Association of Milk and Food Sanitarians, Inc. at Louisville, Kentucky, October 7-10, 1957.

59. Lushbaugh, C. C. and Spalding, John F.
THE NATURAL PROTECTION OF SHEEP FROM EXTERNAL BETA RADIATION. American Journal of Veterinarian Research 18, 345-61 (1957).

In April and May of 1953 sheepmen, wintering sheep north of the Nevada Proving Grounds, attributed heavy losses in their flocks to residual radiation from the atomic tests of that spring. Local veterinarians were unable to determine the cause of the malady which was manifest by progressive stages of erythama, desquamation, and papule and pustule formation on the face, ears, sides, and back. The loss of hair about the muzzle and the tips of the ears with ulceration and crust formation was suggestive of radiodermatitis. An extended study led to a diagnosis of infectious pustular dermatitis. During the study it was determined that the threshold dose of radioinduced epilation of sheep skin ranged from 2,500 to 15,000 r.e.p., depending on the thickness of the wool.

60. Machta, L.; Hamilton, H. L.; Hubert, L. F.; List, R. J.; and Nagler, K. M. AIRBORNE MEASUREMENTS OF ATOMIC DEBRIS. Journal of Meteorology 14, 165-75 (1957).

Radioactivity data collected by airborne equipment during the first of the Nevada atomic tests. The relative values are useful in checking meterological trajectories and in making crude estimates of lateral diffusion.

61. Machta, Lester
METEOROLOGICAL FACTORS AFFECTING SPREAD OF RADIOACTIVITY FROM NUCLEAR BOMBS. Journal of the Washington Academy of Sciences 47, 169-79 (1957).

Meteorological considerations accounting for atmospheric dispersal of all types of radioactive particulate debris caused by a nuclear explosion are explored on local, intermediate, and delayed dispersement phases. Considerations for local dispersement, accounted for in a day or less, are: (1) relative time of fall, as a function of altitude, used to predict downward transfer of fallout, (2) turbulent diffusion causing significant gravitation fallout velocity at rate of 0.1-0.01 mile/hr. of particles of specific gravity 2.5 and 50 + μ diameter, and (3) precipitation usually caused by moisture entrained in the fireball and condensing upon cooling. Intermediate fallout, extending a day to a month, usually originates in the troposphere and rarely penetrates the tropopause unless the fireball is from a high-yield detonation. Transversal displacement of debris is computed to be predominantly cumulative in the same latitude as characterized by the motion of atmosphere determined by air masses carried zonally or latitudinally. However, anomalous situations can spread the debris to an entirely new and spearate area; therefore, apportionment of fallout in the intermediate stage suggests newer and more efficient methods of determining radioactive fallout are of immediate concern. Stratospheric sampling holds the key to residence time and removal rate of radioactive debris. The distribution in time and space may allow predictions for better quantitative interpretation of residence time of Sr^{90}.

62. Marei, A. N.
EVALUATION OF SR^{90} AS CONTAMINATING FACTOR. Medical Radiology 2, 89-95 (1957). (In Russian).

63. Miyake, Y.; and Saruhashi, K.
WORLD-WIDE STRONTIUM 90 DEPOSITION DURING THE PERIOD FROM 1951 TO THE FALL OF 1955. Meteorology and Geophysics 8, 241-4 (1957).

64. Miyake, Y.; Sugiura, Y.; Saruhashi, K.; and Kanazawa, T.
ESTIMATION OF THE AMOUNT OF SR-90 DEPOSITION AND THE EXTERNAL INFINITE GAMMA DOSE IN JAPAN DUE TO MAN-MADE RADIOACTICITY. Meteorology and Geophysics 8, 222-231 (1957).

65. Mori, Takajiro; and Saiki, Masamichi
RADIOACTIVITY OF FISHES CONTAMINATED BY NUCLEAR-BOMB TEST EXPLOSIONS WITH SPECIAL REFERENCE TO THE NUCLIDES.
Nippon Nogeikagaku Kaishi 31, A79-A86 (1957).

The nuclides formerly found in contaminated fish are Sr^{89}, Sr^{90}, Y^{90}, P^{32}, Cs^{137}, and Ru^{106} in bones and scales and Cs^{137}, Ru^{106}, Ce^{144}, Pr^{144}, Zr^{95}, and Nb^{95} in viscera and muscles. Moreover the following were found newly by M. and S.: Zn^{65}, $Cd^{113m, 115}$, $Fe^{55, 59}$, Mn^{54}, Ba^{140}, and La^{140} in viscera and muscles.

66. NATURE OF RADIOACTIVE FALLOUT AND ITS EFFECTS ON MAN. Hearings before the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, Congress of the United States, 85th Congress, 1st Session.

Part 1. May 27-June 3, 1957. p. 1-1008. Catalog no. Y4.At7/2:F 19/pt. 1. Part 2. June 4-7, 1957. p. 1009-2065. Catalog no. Y4.At7/2:F 19/pt. 2. U. S. Government Printing Office, Washington 25, D. C.

67. Neel, J. V.
THE DELAYED EFFECTS OF IONIZING RADIATION. Journal of the American Medical Association 166, 908-16 (1958).

There is complete agreement among geneticists concerning the general outlines of the problems raised by the increasing exposure of mankind to ionizing radiation. There is equally complete agreement concerning the benefits of its legitimate application in medicine and industry. The problem is to strike a balance between the two, but much critical information is lacking. The program of testing nuclear weapons must be considered as a benefit to national security as well as a hazard to the population. The investigations of the genetic damage from nuclear weapons are summarized. The results obtained so far are of interest but naturally it will require many years to reach a conclusion. The genetic effects of exposure to x-rays, fallout, and nuclear energy installations and estimations of safe dosage are discussed extensively.

68. Neuman, W. F.
SOMATIC EFFECTS OF FISSION PRODUCTS. Bulletin of the Atomic Scientists 14, 15-18 (1958).

69. Neuman, W. F.
UNCERTAINTIES IN EVALUATING THE EFFECTS OF FALLOUT FROM WEAPONS TESTS. Bulletin of the Atomic Scientists 14, 31-4 (1958).

70. Nishiwaki, Yasushi
BIKINI ASH. Atomic Scientists Journal 4, 97-109 (1954).

71. Obo, Fujio; Wakamatsu, Chikanori; Nakae, Yoshitake; and Higasayama, Sumishige. CONTAMINATION OF FOODS BY RADIOACTIVE RAINS. Igaku to Seibutsugaku 36, 249-52 (1955).

The radioactivities of various vegetable foods contaminated by radioactive rains in May, 1954, in the Kagoshima Area were detected. Tea showed especially high radioactivities which could be extracted with hot water. Radioactive Nb, Zr, Hf, Ce, Y, Pr, and La were detected in the hot water extractions of tea by ion-exchange chromatography. The partial contribution of K^{40} in these radioactive vegetables was critically examined.

72. Obo, Fujio; Wakamatsu, Chikanori; Hiwatashi, Yoshihiro; Tamari, Tamehiko; Nakae, Yoshitake; and Tajima, Daisaburo. THE BIOLOGICAL INFLUENCE OF ASH FROM RADIOACTIVE FISH. Igaku to Seibutsugaku 35, 57-9 (1955).

Bones of a radioactive fish were ashed, extracted with 10 per cent HCl, and the extraction was neutralized with 10 per cent NaOH to give a white precipitate suspended in H_2O. The suspension was fed to rabbits. Most of the radioactivity was excreted in the feces, a small portion was retained in the cecum. Internal radioactivity was highest in the bones.

73. Obo, Fujio; Wakamatsu, Chikanori; Hiwatashi, Yoshihiro; Tamari, Tamehiko; Nakae, Yoshitake; and Tajima, Daisaburo. RADIOACTIVITY OF FISH II. Igaku to Seibutsugaku 34, 255-8 (1955).

Various tissues of fish captured east of Formosa after the Bikini H-Bomb experiment had radioactivities (detected on May 27, 1954) in counts/min/ash from 5 g. fresh tissues: blood 2414, eyeball 49, heart muscle 111, white muscle 11, red muscle (chiai) 123, bone 46, skin 28, pancreas 131, liver 522, stomach muscle 106, stomach contents 52, spermatozoa 47, and spleen 504. High radioactivities in blood and blood synthesizing organs (liver and spleen) were emphasized. The radioactivity in the blood had a half-life of 34-35 days and the maximum energy of β-ray of approximate 0.4 m.e.v.

74. Obo, Fujio; Wakamatu, Chikanori; Hiwatashi, Yoshihiro; Tamari, Tanehiko; Nakae, Yoshitake; and Tadima, Daizaburo. BADIOACTIVITY OF FISHES. IV. ANALYSIS OF FISH-ASHES. Medicine and Biology 36, 32-5 (1955).

75. Ogawa, Iwao
FALLOUT AND RICE CONTAMINATION IN JAPAN. Bulletin of the Atomic Scientists 14, 35-8 (1958).

76. Pace, F. C.
RADIOACTIVE FALLOUT FROM ATOMIC WEAPONS. Behind the Headlines 16, 1-12 (1956).

77. Rafter, T. A.; and Fergusson, G. J.
ATOMIC BOMB EFFECT-RECENT INCREASE OF CARBON-14 CONTENT OF THE ATMOSPHERE AND BIOSPHERE. Science 126, 557-8 (1957).

An indication of increasing C^{14} content of the atmosphere was found during a project of sampling atmospheric CO_2 in New Zealand in 1954. The collection of samples was continued in order to determine whether the enrichment was due to seasonal variation of C^{14}, or an enrichment of the atmosphere, caused by atomic explosions. The 9 samples, assayed since 1953, showed an enrichment of 7.8 per cent with respect to the New Zealand wood standard of 1953. This value, correlated for "industrial effect", (depletion of atmosphere C^{14}, due to combustion of fossil fuel), was found to be 4.8 ± 0.5 per cent of the atmosphere of the southern hemisphere. Other methods of sampling were used to verify this result. One was to expose a tray, filled with $Ba(OH)_2$ solution to the atmosphere; such samples showed an increase in C^{14} specific activity of 4.9 ± 0.6 per cent between May 1955 and May 1957. This increase was detectable in leaves, trees, and grass from a location from which samples had been previously assayed. By using Libby's data (C.A. 50, 10522h) to estimate from the C^{14} increase the total power of atomic weapons to date, the 4.8 per cent increase for the atmosphere would account for 48 megaton of TNT equivalent of fission for the southern hemisphere and greater for the northern hemisphere, where all the atomic tests took place. From a comparison of the atmosphere C^{14} specific activity with time in the 2 hemispheres, the possible rade and mechanism of mixing can be estimated.

78. Russell, R. Scott; and Milbourn, G. M.
RATE OF ENTRY OF RADIOACTIVE STRONTIUM INTO PLANTS FROM SOIL. Nature 180, 322-24 (1957).

79. Sadchikov, S.; and Andreeva, O.
INVESTIGATION OF THE RADIOACTIVITY OF COW MILK. Molochnaya Promyshlennost 18, 34-5 (1957)

The highest concentration of radioactive I^{131} in milk was found in the fat. I^{131} of milk varied, however, from 1.5×10^{-8} c./l. and was from 13.8 to approximate 20.0 per cent of that emitted by the Pyatigorsk mineral waters.

80. Sams, C. F.
THE MEDICAL ASPECTS OF RADIATION FALLOUT - CURRENT CONCEPTS. Journal of the American Medical Association 166, 930-3 (1958)

Variables which have a major impact on the appraisal of radiation hazards from fallout include: (1) nonuniformity of fallout within a given isodose area; (2) the shielding factor; (3) the conversion of these variables into terms of absorption of energy from varying external gamma radiation over a period of time at six critical areas within the human body; (4) evaluation of these different energy absorptions in terms of different functional responses, including direct local and indirect whole body responses, both in the acute and delayed phases; and (5) the variables of internal emitters as well as direct surface contamination. It is possible that attenuation factors in buildings may increase the lethal limit in the sense that there may be sufficient survivors to constitute a medical problem in a fallout field in the event of a thermonuclear attack.

81. Schubert, Jack; and Lapp, Ralph E.
GLOBAL RADIATION LIMITS. Bulletin of the Atomic Scientists 14, 23-6 (1958).

82. Shilling, C. W.
RADIATION AND ITS HAZARDS. Atomics and Nuclear Energy 9, 198-201 (1958).

83. Shipman, William H.; Simone, Philip; and Weiss, Herbert
DETECTION OF MANGANESE-54 IN RADIOACTIVE FALLOUT. Science 126, 971-2 (1957).

An isolation procedure was adapted to the analysis of a γ-emitter with an energy of 0.84 m.e.v. from fallout samples following nuclear test explosions. Mn^{54}, Ce, and Zr carriers plus the sample were oxidized with $NaClO_3$. (cont'd.)

83. Shipman, William H. et al
DETECTION OF MANGANESE-54 IN RADIOACTIVE FALLOUT. (cont'd.)

The insoluble MnO_2 was reduced with $NaHSO_3$, dissolved in HCl, and the mixture was freed of interfering nuclides with Fe(OH) (OAc). The Mn was precipitated as $MnNH_4PO_4$ and ignited to $Mn_2P_2O_7$, which was counted. The γ-spectrum of the isolated sample was identical with that of authentic Mn^{54}. This nuclide accounted for 40 per cent of the total γ-activity of the sample. Calculations indicate that megacurie quantities were produced at the time of detonation, possibly from stable Mn and Fe, emphasizing the importance of induced radioactivity in fallout.

84. SHORTER-TERM BIOLOGICAL HAZARDS OF A FALLOUT FIELD. Washington, D. C., U. S. Government Printing Office, 1958. 236p. Y3.At7:2F 19.

On December 12, 13, and 14, 1956, a symposium on the shorter-term biological hazards of a fallout field was held at the Pentagon, Washington, D. C., under the joint sponsorship of the Atomic Energy Commission and the Department of Defense. The purposes were to review the basic information related to the more immediate effects of fallout, both biological and physical, laboratory and field, and to suggest new research approaches to the many unresolved problems.

85. Sievert, R. S.; Gustafsson, S.; and Ryland, C. G. GAMMA RADIATION FROM SOME SWEDISH FOODSTUFFS. <u>Arkiv Fysik</u> <u>12</u>, 481-9 (1957).

The γ-radiation from powdered milk, beef, bone from cattle, and vegetables, collected and preserved in the years 1952 to 1956, has been investigated in May to September 1956 by means of two high-pressure ion chamber apparatuses placed in a low-background laboratory. In every case a significant increase was observed which seems to originate from fallout from atomic bomb tests. Investigations of the γ-radiation from children have been repeated, but no increase could be observed in comparison with earlier tested subjects in approximately the same age and weight classes (101 subjects, 1954; 79 subjects, 1956). (Some further measurements of γ-radiation from powdered milk, beef, bone, and thyroid from grazing cattle have been added in the proof).

86. Smirnov, N. S.
PROBLEM OF THE INFLUENCE OF AN ATOMIC EXPLOSION ON THE STATE OF THE ATMOSPHERE. Akademiia Nauk SSSR. Izvestiia. Ser. Geofiz. No. 10. 1227-31 (1956).

The author reviews briefly various American, Western European and Japanese studies dealing with the effect of atomic explosions upon the state of atmosphere. He then considers the possible changes in the radiation radioactive properties of the atmosphere that can be caused by the explosion of one atomic bomb, how the increase in radioactivity can influence the radiation balance of the earth, the effect of atomic explosions upon the dust, ion and aerosol content of the atmosphere and the meteorological effects of atomic explosions such as the occurrence of fogs, etc.

87. Terentiuk, F.
MEASUREMENT OF ARTIFICIAL RADIOACTIVITY IN THE ATMOSPHERE AT OTTAWA, CANADA. Canadian Journal of Physics 36, 136-139 (1958).

In recent years there has been considerable interest in the artificial radioactivity in the atmosphere originating from atomic and thermonuclear explosions. For the past year daily measurements of radioactivity have been made at Ottawa. The sampling times corresponded to air volumes of 42[illegible] cubic metric and 2,000 cubic meters, respectively. Filters were kept for a period of 3 days before measurements were made in order to permit natural activity resulting from daughter products of radon and thoron to decay to a negligible value. Measurements of the gross beta activity from the filters were made directly end-window Geiger tubes. Filters showing considerable initial radioactivity were measured at intervals of a few days in order to obtain the rate of decay of the activity. It was hoped that the data obtained would make it possible to fix the date of the explosion responsible for the filter activity but the fixing of dates was very uncertain.

88. Volchok, H. L.; Kulp, J. L.; Eckerlmann, W. R.; and Gaetjen, J. E. DETERMINATION OF SR-90 AND BR-140 IN BONE, DARIY PRODUCTS, VEGETATION, AND SOIL. Annals of The New York Academy of Sciences 71, Art. 2, 293-304 (1957).

Fission product contamination in many natural materials requires an efficient chemical procedure for the separation, purification, and absolute measurement of certain isotopes at very low levels. As part of the study of the distribution of long-range fallout from nuclear tests, a technique for the determination of both strontium-90 and barium-140 has been developed. The sample materials include bone, cheese, milk, vegetation, and soil. The first four sample types contain calcium phosphate as a major part of their ash. The separation of the phosphate from calcium, strontium, and barium is necessary for these sample types. Soils contain exchangeable calcium as well as non-exchangeable calcium in the silicate lattices. Since strontium and barium will follow calcium under the proper conditions, procedures were designed around the chemistry of calcium, which acts as a carrier for strontium and barium. In all cases the preliminary chemical procedure yields a calcium chloride solution carrying the radioactive strontium and barium. The radioactivity measurements are made on the daughters of strontium-90 and barium-140, that is, yttrium-90 and lanthanum-140, respectively, which are extracted from the solution.

89. Wald, Niel
LEUKEMIA IN HIROSHIMA CITY ATOMIC BOMB SURVIVORS. Science 127, 699-700 (1958).

90. Whitlock, Gaylor P.
RADIATION FROM STRONTIUM-90 NOT FOUND IN MILK IN HARMFUL AMOUNTS. Journal of Dairy Science 40, 592-3 (1957).

Increased amounts of strontium-90 have been detected in our milk supply probably as a result of nuclear fallout which reaches our soil and enters plant life. Even so, the radiation level from strontium-90 now reaching human beings in the United States from all sources is less than one percent of the amount of radiation which would be harmful. It is possible to detect and measure with accuracy the presence of less than one ten-thousandth of the amount of radioactive strontium which scientists have declared safe for industrial practice. (Cont'd.)

90. Whitlock, Gaylor P.
RADIATION FROM STRONTIUM-90 NOT FOUND IN MILK IN HARMFUL AMOUNTS. (cont'd.)

We realize that radiation is essential to life. Humans are exposed to more radiation from other sources, including natural deposits of radium and cosmic rays, than from bomb fallout. We have a long way to go before the strontium-90 in milk and other foods can catch up with the amounts of radio-activity to which we have long been exposed through natural sources.

91. Wolff, Arthur H.
RADIOACTIVITY IN ANIMAL THYROID GLANDS. <u>Public Health Report</u> <u>72</u>, 1121-1126 (1957).

Iodine-131 activity was readily found in thyroid glands from grazing animals in Arizona, Pennsylvania, Ohio, and Oregon within 2 weeks following the start of the 1956 U. S. Pacific atomic weapons tests. A progressive increase was noted in the proportion of samples which were active from mid-May to mid-October, at which time the study was terminated. Based on the Arizona and Ohio data, the average weekly dosages from mid-May to mid-October to cattle and sheep were 35 and 120 millirontgen equivalent physical, respectively, apparently harmless to the health of animals. It is suggested that the average cattle I^{131} level found in this study is approximately the average continuously existing in U. S. cattle during the past 2 or 3 years. Theoretical considerations indicate that with the levels of I^{131} found in cattle thyroids, detectable amounts of I^{131} would have been secreted with the fresh milk produced in these areas.

92. Yatazawa, M. and Ishihara, T.
THE ABSORPTION BY PLANTS OF UNSEPARATED FISSION PRODUCTS DERIVED FROM THE HYDROGEN BOMB DETONATED IN THE SPRING OF 1954 AT BIKINI ATOLL. <u>Nippon Nogei-Kagaku Kaishi</u> <u>29</u>, 229-34 (1955).

In a radiochemical survey on the contamination of white clover grown in a field sample plants were obtained from the same grass land at 3 different times. The ash of each sample was analyzed. It was concluded that radioactive alkaline earths, especially Sr^{89} and Sr^{90}, were selectively accumulated in plants. The selective absorption of Bikini ash by rice plants was also studied. (cont'd.)

92. Yatazawa, M. et al
THE ABSORPTION BY PLANTS OF UNSEPARATED FISSION PRODUCTS DERIVED FROM THE HYDROGEN BOMB DETONATED IN THE SPRING OF 1954 AT BIKINI ATOLL. (cont'd.)

Noncontaminated rice plants were cultivated in the radioactive solution produced from Bikini ash for 20 days. Then the absorption by plants of radioactive elements was examined by chromatographic exchange. From the elution curve and ratio of radioactivity of each separation group, it has become clear that rice plants accumulated larger parts of fission products in their roots and selectively absorbed and translocated radioactive alkaline earths in their shoots even i1 the absorption ratio of Bikini fission products was comparatively small.

AUTHOR INDEX

AUTHOR INDEX