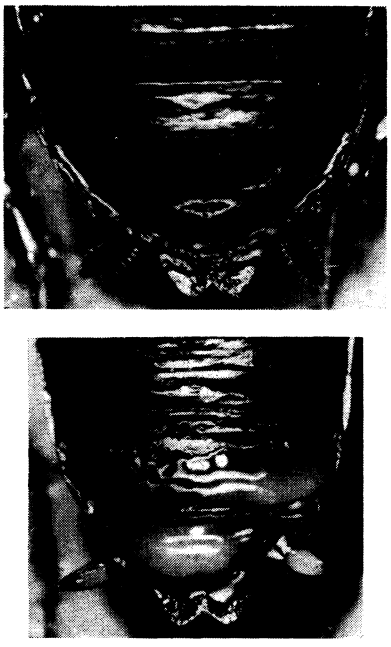

Fig. 1. Terminal, dorsal abdominal segments of adult females of *Blatta orientalis* (×4.6). (Top) Specimen from crowded culture has very little secretion on the tergites and cerci. (Bottom) Isolated virgin 2 weeks old accumulated a large amount of cloudy secretion on the sixth and seventh tergites and the cerci. The clear fluid on the supra-anal plate and around the bases of the cerci was probably exuded from the anus when the insect was anesthetized with CO_2. [Photographs by E. R. Willis]

was soluble in water and insoluble in petroleum ether.

The analysis of this material was as follows: An estimated 10 percent by weight of the dry sample was combined carbohydrate as detected by the anthrone reaction. A negative test for free sugars as reducing sugars was obtained using triphenyltetrazolium chloride. No reducing sugar was present after hydrolysis, but a polysaccharide was indicated by its reaction with aniline phthalate reagent. Chlorides and phosphorous were present qualitatively in trace amounts, further indicating the inhomogeneity of the sample. There was an average of 1.90 percent ash. Averages of duplicate elemental analyses gave the following: 14.30 percent nitrogen, 45.85 percent carbon, 7.21 percent hydrogen, and 0.45 percent sulfur.

About 90 percent of the sample was calculated to be protein. The following amino acids, qualitatively identified by paper chromatography, were present in the protein hydrolyzate: aspartic acid, glutamic acid, serine, glycine, tyrosine, alanine, methionine, leucine (isoleucine?), proline, and lysine. If one assumes that the entire amount of sulfur was found in methionine, since no cystine was present, then 2.1 percent methionine was present. This order of magnitude was indicated in the methionine spot on the two-dimensional paper chromatogram. Four percent of the total nitrogen existed as the free amino acid glycine and an unidentified free di- or tripeptide, as estimated by two-dimensional paper chromatography.

The function of the secretion is unknown; the significance, if any, of the absence of this material in viviparous and false ovoviviparous cockroaches is not understood. Stock and O'Farrell (*3*) suggested that in *Blattella germanica* the secretion may help keep the young nymphs together in loose aggregations; but our observations of colonies of cockroaches that secrete this material do not support this idea. Although we have seen cockroaches in aggregates, we have never seen any form of "webbing" or fibers that might tend to keep the insects together.

The fact that the material accumulates rapidly on the backs of isolated individuals (Fig. 1) indicates that in crowded cultures (where the secretion is rarely seen) the secretion is either rubbed off or perhaps eaten off by the insects. The oriental cockroach is capable of eating the material despite its viscous nature. On 9 May 1952, Edna Roth and Marc Roth observed a newly emerged adult of *Blatta orientalis*, which had been isolated for several weeks as a nymph, eat its own secretion and exuvia. If a type of trophallaxis exists among some species of cockroaches, whereby nymphs eat this material off each other, it is conceivable that the secretion, high in protein, could serve as a supplemental food.

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13 October 1955

Distribution of Alpha-Radioactivity in Certain Forest Types

It is known that various types of forests accumulate calcium and other bases in the organic matter layer at the surface of their soils (*1*). In the current study, a similar accumulation was found for alpha-emitting radioactive substances.

Table 1. Vertical distribution of alpha-radioactivity. Units are counts per hour, per square centimeter.

Vertical position in forest	Average	
	Wis.	S. Appalachians
Living leaves of dominant tree	1.74 ± 0.21	4.63 ± 0.51
A_0 layer beneath dominant tree	8.28 ± 0.79	12.68 ± 1.13
A_1 layer of soil	4.32 ± 0.68	3.31 ± 0.39
C layer of soil	1.11 ± 0.10	0.85 ± 0.08

Eighty stands of hardwood and conifer forest in Wisconsin and in the southern Appalachian region were examined in 1953 and 1954 for alpha-radioactivity by the scintillometer method of Ockerman and Daniels (*2*).

Analyses were made of leaves of the dominant trees, of the dead and decomposing litter (A_0 layer) beneath those trees, and of the topsoil (A_1 layer) and subsoil (C layer). All samples were ashed at 600°C for 8 hours, ground to pass 100 mesh, and stored for 2 to 4 weeks before testing. The results are presented as counts per hour, per square centimeter of the test surface in an "infinitely thick" layer (*3*). The results for individual samples are the averages of duplicate tests, each of which was counted to a statistical precision of ± 20 percent at the 90-percent confidence level by the accumulation of at least 70 counts above background. The background counts themselves did not exceed 0.1 to 0.2 counts/hr cm^2. The variations shown in Table 1 are standard errors.

The vertical distribution of alpha-radioactivity from subsoil to living leaves was similar in all forest types that were examined in both geographic regions, as shown by the average values in Table 1. The subsoil values were remarkably constant in all stands, but the intensity of the maximum activity in the A_0 layer varied greatly in different forest types. Hardwood forests in the prairie-forest border region of southwestern Wisconsin (*4*), which were dominated by species of *Quercus, Carya, Tilia,* or *Acer,* were uniformly low in alpha-radioactivity, while mixed conifer-hardwood or pure conifer forests in northeastern Wisconsin, the Cumberland Mountains, and the Great Smoky Mountains were usually high in activity (Table 2). The highest values in the A_0 layer were found in forests that were dominated by species of *Abies, Picea, Tsuga,* and *Fagus.* All such forests examined were characterized by a relatively low July temperature (67°F or less), a soil acidity of *p*H 5.5 or less, and an A_0 layer of the mor humus type (*1*) which weighed 1.5 kg or more per

Table 2. Alpha-radioactivity of the A_0 layer in different forest types. Units are counts per hour, per square centimeter.

Species dominant in forest	Average		
	S.W. Wis.	N.E. Wis.	S. Appalachians
Acer saccharum	2.63	6.77	8.35
Tilia americana	3.30		
Quercus sp.	3.28		
Carya sp.	3.42		8.46
Pinus sp.		5.11	
Fagus grandifolia		6.61	8.75
Tsuga canadensis		9.14	9.87
Abies sp.		6.70	20.70

square meter. The retention of the alpha-emitting substances in the mor humus may be related to the specific nature of its chelating humic acids (*5*). Further work on this relationship is in progress.

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17 October 1955

Acute Myeloid Leukemia Following Prolonged Iodine-131 Therapy for Metastatic Thyroid Carcinoma

There is considerable current interest in the role of radiation in producing leukemia. Reports to date of both human and animal studies (*1, 2*) have been concerned with the results of external radiation. We are reporting here the occurrence of leukemia subsequent to prolonged irradiation exclusively by an internally administered radioisotope (*3*).

Two instances of acute leukemia have developed in the Montefiore Hospital series (*4, 5*) of sixteen patients with metastatic thyroid carcinoma who have been treated intensively with radioiodine. The radioiodine administered to this group of patients, commencing in 1943, ranged from 195 mc to 2290 mc over a 6-month to 9-year interval. A detailed clinical report of these two cases is in preparation.

The first patient (J.F.) to develop leukemia received 13 therapeutic doses of I^{131} from 1947 to 1951, totalling 1455 mc. He was 58 years old when therapy started. Employing the methods and data reported previously (*6*), we estimate that he received a cumulative blood radiation dose of about 600 rad (Fig. 1). The amount of generalized body radiation received is, usually, about half the blood radiation dose (*6*). The patient died in 1951 with a clinical picture of acute myeloid leukemia. Post-mortem studies revealed, among other findings, myeloid leukemia involving bone marrow, spleen, liver, and lymph nodes, as well as anaplastic carcinoma of the thyroid metastasizing to cervical lymph nodes, skull, spine and lungs.

The second patient (B.L.) received a total of 1730 mc of I^{131} from 1948 to 1953, which we grossly estimate delivered 550 rad to the blood. She was 61 years old when therapy was initiated. As indicated in Fig. 2, this patient received 20 therapeutic doses of radioiodine, the first two of which were administered at Mt. Sinai Hospital, New York. Although that hospital reported that the white blood count was 6500, the patient had recurrent leucopenia after she came under our observation. The leucopenia, associated with a persistent severe anemia, became more marked in her last 3 years. In June 1953, her differential count began to show abnormal forms and high "lymphocyte" counts. In September 1954, the white blood count began to rise rapidly, with a high proportion of myeloblasts, and the patient was readmitted to the hospital because of persistent bleeding. She died 5 weeks later, exhibiting the clinical and hematological features of acute myeloid leukemia. The autopsy findings included acute myeloid leukemia with infiltrates in bone marrow, spleen, liver, lungs, kidneys, and pancreas, and metastatic thyroid adenocarcinoma in the skull.

A causal relationship between radioiodine therapy and leukemia is not definitely established by these results. However, the occurrence of these two cases in a series of 16 patients tends strongly to validate the correlation. Moreover, the experimental production of leukemia

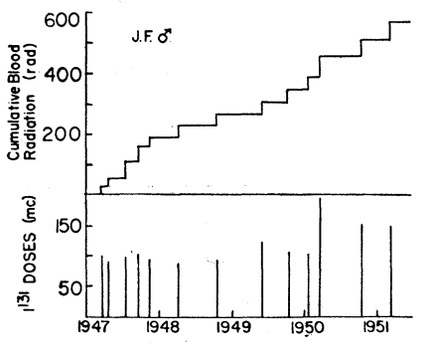

Fig. 1. Patient J.F. The cumulative blood radiation and the therapeutic doses of I^{131} administered are plotted as a function of time.

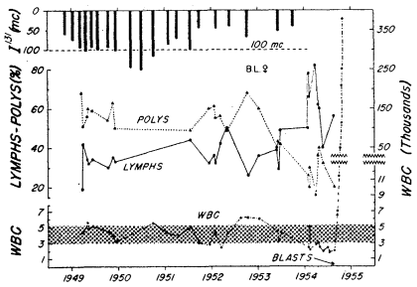

Fig. 2. Patient B.L. Variation of the white blood cell count, lymphocytes, and polycytes with time. The bars at the top indicate the occurrence and magnitude of the radioiodine doses administered to the patient.

in animals by radiation (*7*), the frequent occurrence of leukemia among radiologists as compared with other physicians (*8*), and the high incidence of myeloid leukemia among the survivors of the Hiroshima and Nagasaki atomic explosions (*1*) are all consistent with the existence of a relationship between the radiation received during massive radioiodine therapy and the subsequent development of leukemia. Furthermore, two case histories have been published (*9*) in which development of acute leukemia has been reported subsequent to external radiation followed by I^{131} therapy for thyroid carcinoma.

It is noteworthy that the type of leukemia developed by both patients reported here was acute. This is consistent with the recent report of Moloney (*10*) that, of 92 cases of leukemia occurring among survivors of atomic bombing, 52 were acute or subacute and only 40 were chronic. Moloney's observations, as well as the relatively small number of cases of chronic leukemia among radiologists, as compiled by March (*8*), seem incompatible with the view that leukemia following irradiation is generally chronic (*2*). The delay in the onset of leukemia, which occurred 4 and 5 years, respectively, after initiation of radioiodine therapy, is consonant with Moloney's observations (*10*) that in survivors of atomic bombing the disease has had a latent period of 2 to 9 years, appearing most frequently 4 to 6 years after exposure.

The body radiation dose received during I^{131} therapy for hyperthyroidism is at most a few percent of that received by patients who are treated for thyroid carcinoma, and it is considerably smaller than the apparent minimum leukemogenic dose, which Moloney (*10*) found to be about that required to produce severe radiation complaints. Acute systemic radiation effects are not encountered in the course of I^{131} therapy for hyperthyroidism. It is, therefore, unlikely that the incidence of leukemia in