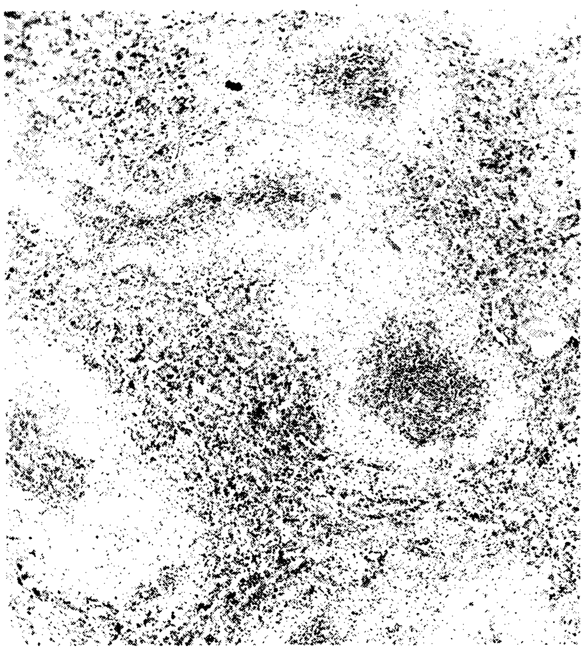

FIG. 2. Spleen from a guinea pig with chronic scurvy (hematoxylin-eosin; ×48). Army Institute of Pathology.

In animals showing amyloid deposition, the spleen was severely involved, the liver moderately, and the adrenal cortex only minimally in a few cases. Amyloid was not found in organs other than those mentioned in the chronically scorbutic guinea pigs.

Microscopically, the amyloid appeared in the spleen in the form of a thick band in the peripheral portion of the Malpighian corpuscles, extending at times to a minor degree into the pulp. (Figs. 1 and 2.) The central portion of the corpuscles appeared normal. The pulp was relatively poor in cells and contained prominent sinusoids. In the liver, amyloid was noted in moderate amounts between the hepatic cords and the walls of the sinusoids. The peripheral two-thirds of the hepatic lobules were as a rule more severely affected, the hepatic cells in these areas appearing small, atrophic, and compressed by the amyloid material. No definite intracellular amyloid was noted in the spleen or in the liver. In the adrenal cortex amyloid was noted in small amounts, again in close apposition with, and at times completely surrounding, the walls of capillaries lying among the cortical cells.

Iodine and sulfuric acid tests on the gross specimens, and crystal violet and Congo red stains on the sections, were all positive. However, the tinctorial response of the amyloid, particularly with Congo red, was not as brilliant as is usually seen in pathological specimens from man. The results of the tests with special stains, together with the typical distribution of the amyloid in the immediate neighborhood of capillaries and of reticuloendothelial elements, is characteristic of this disease, in both man and experimental animal. The minor differences of the tinctorial response from that usually observed in man can probably be explained on the basis of age of deposition and molecular arrangement of the amyloid.

At the present time the exact chemical composition of amyloid is not known and the etiology and pathogenesis of amyloidosis are not clear. Experimentally, amyloidosis has been produced in mice, rats, hamsters, rabbits, dogs, and horses by various means (*1, 2, 4, 5, 7, 8, 9, 11, 13*). These include: supplementation of the diet with cheese; injection of bacteria, casein, sodium caseinate, pentose nucleotides, human serum, sulfur, selenium, or sodium silicate; inoculation with *Leishmania donovani;* and implantation of homologous tissues. Allegedly, amyloidosis has also been obtained in the experimental animal by injection of sodium bicarbonate, sodium hydroxide, hydrochloric acid, or animal tar (*12*). In addition, amyloid has been found in tumor-bearing mice (*6*).

Our observations do not warrant any positive conclusion, however attractive, as to the possible role of ascorbic acid or inanition, either alone or in combination in the pathogenesis of amyloid deposition. We feel, however, that these observations should be reported for two reasons: because to our knowledge, amyloidosis has never been detected in the guinea pig, and because amyloidosis has never been produced in animals by means of a deficient diet.

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Radiophosphorus and Radiostrontium in Mosquitoes. Preliminary Report

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The possibility of employing radioactive isotopes for marking mosquitoes for subsequent recognition has led to a study of behavior of P^{32} and Sr^{89} in colonized *Aëdes aegypti*, with a view to developing techniques by which such marking might be applied to large numbers of mosquitoes under field conditions. The usual methods of marking involve relatively drastic procedures, such as dusting and spraying the captive adult mosquitoes before

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release, and thus subjecting them to considerable manipulation and trauma.

The ideal marking procedure should insure (1) ease of application to large mosquito populations; (2) minimal manipulation, preferably none at all; (3) ease of recognition of the marked mosquitoes without killing them, when this is desired; (4) certainty of persistence of the marking throughout the life of the mosquito; (5) freedom from deleterious biological influences.

It seemed that all of these conditions could probably be met by a radioactive element, provided it were bound by the mosquito tissues and not excreted. Sufficient radiation energy to be detected readily by the usual equipment would be essential, and the life of the radioactive isotope would need to be long enough to permit ready detection throughout the life of the insect.

Both P^{32} and Sr^{89} were found to be absorbed by the larvae and to be carried through the pupal stage into the adult. For marking purposes P^{32} was used as Na_2PO_4 and Sr^{89} as $SrCl_2$. It was found that concentrations giving radioactivities of 10–20 mμc per cc in the larval baths produced mosquito radioactivities of from 2 to 16 mμc, depending upon the concentration of the larvae and the conditions of feeding. A density of 5 larvae per cc gave satisfactory development provided adequate food was supplied.

Both isotopes showed similar behavior in that they were absorbed chiefly during the fourth stage and were not subsequently excreted from the adult body. The only significant loss was through egg laying, by which an appreciable fraction of P^{32} and a much smaller proportion of Sr^{89} would be passed out. There was no absorption by pupae.

There were no evidences of toxicity with a bath radioactivity of 0.2 μc per cc, which is about 100 times that needed for marking purposes. As the intensity of radioactivity was increased, the first indication of abnormality was the failure of mosquitoes to produce eggs. On dissection of such mosquitoes, no ovaries could be identified. This occurred especially with P^{32} at a radioactivity of about 200 mμc per mosquito. With still higher bath radioactivity, pupation did not occur.

Within the range of radioactivities used for marking purposes, there were no significant differences in longevity of the radioactive mosquitoes and their controls. With both isotopes, however, the females exhibited about twice the radioactivity of the males from the same baths.

Dissection experiments showed a similar distribution of the two isotopes in the mosquito body, a distribution which was independent of the total amount of radioactivity shown by the mosquito. Of especial interest was the finding that nearly 40% of the total radioactivity in female *Aëdes aegypti* mosquitoes could be found in the legs, while there was practically none in the wings.

Four field experiments were made involving the release of radioactive *A. aegypti* and their subsequent capture. In the two largest releases Sr^{89} was used; in the others P^{32} was employed. Photographic trays were used for the larval baths. It was found desirable to allow the larvae to develop to the third stage in other containers so that overcrowding did not occur until they were reaching the fourth stage, which was passed in the radioactive bath, where pupation and emergence also took place. For the first two experiments, pupae were counted into clean water and allowed to emerge from that container. Later, it was concluded that this method was too laborious and that it was possible to estimate the number emerging by dividing the amount of radioactive material disappearing from the bath by the average mosquito radioactivity.

The essential results of these field experiments are given in Table 1.

TABLE 1

SUMMARY OF FIELD EXPERIMENTS WITH RADIOACTIVE *Aëdes aegypti*

No.	Isotope used	Mosquitoes released, No.	Radioactivity bath μc/cc	Radioactive mosquitoes captured	Mean mosquito radioactivity mμc	Maximum age, days	Maximum distance, ft
I	P^{32}	5,000	0.023	15	15.8	9–13	450
II	P^{32}	9,221	0.085	27	2.4	3–13	850
III	Sr^{89}	10,000 (?)	0.024	34	4.2	15–20	1,100
IV	Sr^{89}	252,000	0.019	240	1.8	28	3,800

Catches were made at a series of stations placed around the compass at varying distances from the release point. Human bait was used and the usual catching time was from 6 to 8 o'clock in the evening. Radial disposition of the stations was found most satisfactory for the first few catches of an experiment; later, irregular arrangements were used when it was desired to pay especial attention to certain areas.

It was found in field experiment IV that where the mosquito density in the bath is of the order of 5 per cc, rapid depletion of the radioactive material occurs, so that by measuring the radioactivities of mosquitoes emerging on successive days, it is possible to use the curves so obtained to determine the day of emergence and hence the age of mosquitoes caught subsequently. Also, where there is proper placing of the catching stations, the proportions of radioactive and nonradioactive mosquitoes of the species studied may be used with the estimate of the number emerging to give an approximation of the total population in the area.

It was found in these experiments that the mosquitoes were distributed largely by wind drift rather than their own flight, although the latter contributed. High winds and rains, however, tended to shorten the life span and thus limited the spread. Males and females traveled approximately the same distances, but the males had a survival time of only a few days.