symptoms were removed. The cord and brain stem were removed from each brain and the cords and brains pooled separately. These were ground, diluted to 1: 100 and 1: 1000 and injected into white mice, all of which died in 48 hr with typical W.E.E. symptoms. Similar results were obtained with brain and cord material removed from mice dying with W.E.E. symptoms and from mice dying with symptoms judged to be a mixture of the two diseases.

It is apparent that mice dying with typical poliomyelitis symptoms had W.E.E. virus in high concentration in the central nervous system, and it seems reasonable to infer that there was a concomitant growth of these viruses. It seems reasonable further to assume that whether a mouse died with poliomyelitis or encephalitis was a fortuitous circumstance depending on which virus happened to gain the ascendancy. Unfortunately, the long incubation period of poliomyelitis virus and the short incubation period of W.E.E. virus precluded the possibility of demonstrating the presence of poliomyelitis virus in mice dying with W.E.E. symptoms.

The question why certain viruses interfere with each other while other viruses may grow together in the same host organ or tissue remains unanswered. The observations here reported, that equine encephalomyelitis virus and poliomyelitis virus may grow together in the brains of mice, whereas these viruses interfere with each other in monkeys, do not clarify the situation but nevertheless provide additional information. An elucidation of this fundamental problem will undoubtedly add greatly to our knowledge of the basic mechanisms of virus growth.

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Thyroid Destruction by I^{131}, and Replacement Therapy[1]

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The early work of Graham (*1*) on milk cows, and of Winchester (*5*) on chickens demonstrated a very definite relationship between thyroid function and milk and egg production. Winchester (*6*) also found a parallelism between thyrotropic hormone content of the pituitary, basal metabolism, and egg production of hens. Subsequently, numerous reports have been made concerning the use of various drugs that in one way or another influence metabolism, and eventually the production of farm animals (*3*, *4*). The literature is characterized by a certain amount of disagreement as to the effects of the drugs, and emphasizes the need for further research on the fundamental aspects of thyroid function.

This report presents a method by which thyroids of young chickens have been eliminated by I^{131} irradiation, apparently without damage to the animal other than some possible destruction of parathyroid tissue; a procedure similar to that of Gorbman (*2*), who has reported 100% destruction of thyroids of 2–5-month-old mice by I^{131} injected in doses ranging from 18 to 55 mc of activity per kg of body weight. The work reported here, however, deals with thyroid destruction by I^{131}, or radio-thyroidecrexis,[4] during the first few days of life rather than after the animal has reached full size. Further, by means of thyroxin therapy, birds lacking thyroid glands were brought to full size and into egg production, while similar birds that did not receive thyroxin survived for limited periods only, and grew very slowly.

TABLE 1

IODINE 131 DOSAGE AND PERCENTAGE THYROID DESTRUCTION (RESULTS OF FIVE TRIALS)

Dose I^{131}	No. of chicks	Exposure period	Estimated thyroid destruction
mc/100 g		days	%
1–1.9	2	5	0
	1	over 24	10
2–2.9	1	5	10
	1	5	50
	1	over 24	75
3–3.9	1	over 24	90
	4	over 24	100
4–4.9	1	5	nearly 100
	1	over 24	90
	4	over 24	100
5–5.9	1	5	nearly 100
	4	over 24	100
6–6.9	2	over 24	100
9.2	2	over 24	100

The birds used in these experiments were New Hampshire chicks, obtained from a commercial hatchery, and weighed 40–66 g at the time of I^{131} injection.

[1] Published with the permission of the Director of the Florida Agricultural Experiment Station.

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[4] Since the literature apparently includes no term indicative of thyroid elimination by other than surgical means, the authors have deemed it necessary to introduce a suitable term in order to avoid undue repetition and use of descriptive material. After due consideration, the term "radio-thyroidecrexis" (pronounced *e-krek'-sis*) has been selected to indicate total destruction of the thyroid gland in the live animal by means of a radioactive substance such as I^{131}. Grateful acknowledgement is due Dr. Joseph Brunet, professor of ancient languages, University of Florida, for his cooperation in offering a number of possible terms from which a final selection was made by the authors.

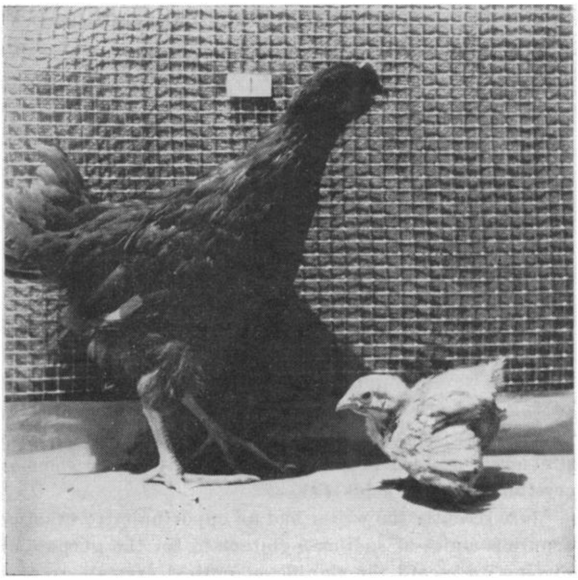

FIG. 1. Influence of radio-thyroid-ecrexis on growth. Control at left, I^{131}-injected bird at right. Both birds photographed at 7 weeks of age.

Carrier-free I^{131} in solution of pH 7–9, which had been prepared by pile-bombardment of tellurium, was used in this work. The values given for the activities of I^{131} were based upon the Oak Ridge National Laboratory measurements and refer to the activity actually injected.[5] Suitable precautions were used to make sure that persons were not exposed to above-tolerance radiation during administration of the isotope and handling of the birds. The I^{131} injections were given intraperitoneally and the puncture was sealed in most cases with collodion.

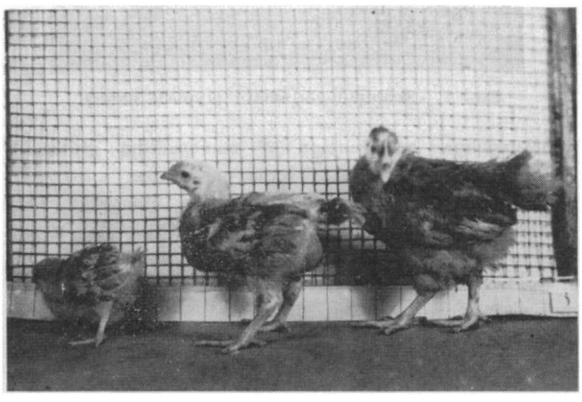

FIG. 2. Effect of thyroid replacement therapy on a bird lacking thyroid. Normal control at right, thyroid-ecrecticized bird injected daily with thyroxin at center. The three birds were 5 weeks of age when photographed.

[5] The radioactive iodine was supplied by the Oak Ridge National Laboratory on allocation from the U. S. Atomic Energy Commission. The ratio of the Oak Ridge National Laboratory millicurie unit of I^{131}, used in the work reported here, to the new National Bureau of Standards millicurie unit is 1.75 : 1.00.

The wing was used as the site of intradermal injection of synthetic D,L-thyroxin in water suspension. A commercial starting and growing mash was fed all birds, and to compensate for possible parathyroid injury, 0.5% calcium gluconate was added to the ration.

On autopsy, sections of thyroid tissue were prepared by the freezing technique in the first two trials, and serial sections were prepared in later experiments.[6] When no trace of the thyroid capsule was found in I^{131}-treated birds, a mass of tissue that included the normal thyroid site was prepared for sectioning.

The degree of thyroid destruction accomplished by various doses of I^{131} and lengths of exposure to radiation are given for five of six trials in Table 1. These results indicate that doses of about 6 mc or more of activity per 100 g of body weight over periods of 24 days (three times the half-life of I^{131}) accomplished complete destruction of the thyroids in the five trials. An anomalous situation existed in the case of trial No. 4, in which even 6.5 mc of activity failed to accomplish complete thyroid destruction. The results of this trial are not included in this report. No explanation has been found for the negative results obtained in this one trial.

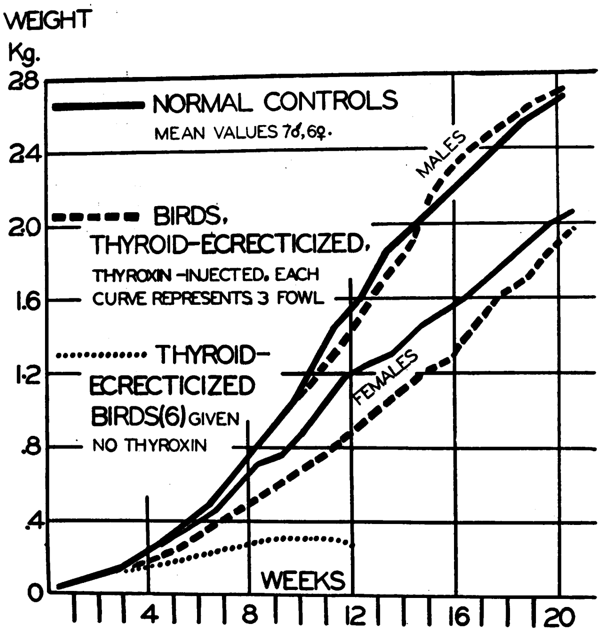

FIG. 3. Influence of radio-thyroid-ecrexis on growth, and of thyroxin on growth of birds lacking thyroids.

Injected chicks, in which thyroids were not found on autopsy, grew very slowly and survived only a limited time after injection (7–18 weeks) unless they were given thyroid replacement therapy. In Fig. 1 are shown a control bird and a thyroid-ecrecticized chick, both 7 weeks

[6] Grateful acknowledgement is due Drs. Nelson A. Murray and Lucien Y. Dyrenforth, of Jacksonville, Florida, in whose laboratories most of the sections were prepared.

of age. In trials 5 and 6 the smaller of each pair of chicks injected with I^{131} at a given level was selected about 2 weeks after injection for replacement therapy. Thyroxin in water suspension was injected daily at a level of 3.8 μg in trial 5, and 5.7 μg in trial 6, per 100 g body weight.

The first visible response to thyroxin injection was rapid resumption of growth. In Fig. 2 are shown a normal control bird, an I^{131}-injected bird, and a thyroid-ecrecticized chick given daily injections of 3.8 μg thyroxin daily.

TABLE 2

EGG PRODUCTION OF THYROXIN-INJECTED HENS AND OF CONTROLS

Hen No.	Dose I^{131} in mc per 100 g body wt	Laid first egg at age in weeks	Egg material per week in g
34	3.1	20	156
56	6.9	19	169
59	9.2	..*	...*
35	0	20	144
54	0	22	Entered production 4 days prior to autopsy

* Condition of the reproductive organs indicated that Hen No. 59 would have laid at an early age.

In Fig. 3 the growth rates of thyroid-ecrecticized, thyroxin-injected birds are compared with those of normal controls, and thyroid-ecrecticized chicks that did not receive thyroxin. Growth and feather development were quickly resumed after the initiation of thyroxin therapy, and some thyroxin-treated birds actually became larger than the comparable normal controls.

Since ionizing radiations are known to have profound effects on the reproductive organs, the egg-producing ability of thyroid-ecrecticized birds, treated with thyroxin, is of particular interest. The experiment was terminated before more than two of the control females had entered production. Two of the three thyroid-ecrecticized females ovulated, and as is shown by Table 2, their rates of production were excellent when the age of the birds is taken into consideration. A third experimental female that received the relatively large dose of 9.2 mc of activity per 100 g body weight was found on autopsy to have developed normally, and presumably she would have laid at an early age.

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Microcrystallographic Data on Sodium-D-Glutamate (Monosodium Glutamate)

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During the period 1936–1940 the writer had occasion to examine microscopically samples of a substance which at that time was considered somewhat of a novelty as a table condiment. This material was the Japanese "Aji-No-Moto," long known and crudely prepared in the Orient as a food supplement. The samples submitted, however, were not pure, containing an appreciable amount of salt and other impurities. The method used for the examination of the material was that which had been previously applied to a microscopic study of the common crystalline amino acids (*4*).

More recently the writer had an opportunity to examine a pure sample[1] of sodium-D-glutamate for the purpose of placing on record the significant optical crystallographic properties of the substance. The increasing widespread interest in monosodium glutamate as a seasoner of foods (*1, 2, 5, 6*) appears to justify a more complete microscopic description than has hitherto appeared. Partial crystallographic and optical data have been recorded (*3, 7*), including only one refractive index.

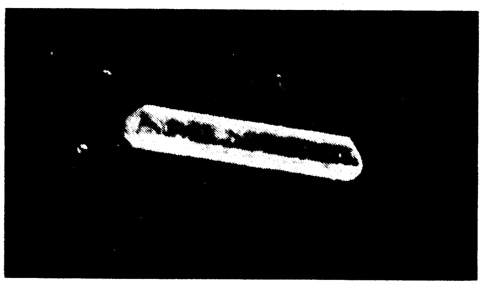

FIG. 1. Sodium-D-glutamate (typical habit).

Microscopic examination of monosodium glutamate ($C_5H_8O_4NNa$) shows that it is crystalline, apparently crystallizing in the monoclinic system, elongated, prismatic forms characterizing the habit (Fig. 1). In parallel polarized light (crossed Nicols), the crystals are elongated parallel to axis *b*, showing parallel extinction and negative elongation. In convergent polarized light (crossed Nicols), partial biaxial interference figures occur, the optic axis figure being most usually shown. Optic sign (–). Refractive indices: $\alpha = 1.500$, $\beta = 1.550$, $\gamma = 1.592$, all ± 0.002.

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[1] Supplied by International Minerals and Chemical Corporation, Chicago, through the kindness of Dr. B. F. Buchanan, Technical Service Director, Amino Products Division.