the growth of the first internode of young seedlings of maize can be considerably reduced if they were kept in an electric oven at 48° C for 30 minutes. It was shown at that time that this effect of reduction of growth depends upon the decrease in auxin (growth hormone) production due to heat treatment. The auxin is produced in the coleoptile tip and controls the growth of the first internode. Thus a decrease in auxin production could account for the decreased growth of the internode. This conclusion was proven experimentally when it was shown that the application of synthetic auxin (indoleacetic acid) immediately after the heat treatment made the internode grow normally again.

The present investigation similarly disclosed that plants having a reduced growth of the first internode, due to ultra-short wave radiation, had a reduced auxin production (See Table 1). The auxin production was

TABLE 1

AMOUNT OF AUXIN, IN DEGREES OF CURVATIVE IN THE AVENA TEST, GIVEN OFF DURING HOURLY PERIODS BY 10 COLEOPTILE TIPS. THE TEST WAS MADE 20 HOURS AFTER THE SEEDLINGS HAD BEEN EXPOSED FOR 20 SECONDS (80929).

	Radiated	Controls
First Hour	6.3	11.5
Second Hour	3.5	6.9
Third Hour	1.9	6.5
Length of mesocotyl (mm)	34.6	44.8

determined by means of the diffusion method.[5]

In a number of cases additional auxin was applied to radiated plants. This was done with a paste of indoleacetic acid in lanolin applied to the tip of the seedlings immediately after the radiation. As experiments showed (see Table 2) such application of additional auxin restored the first internode to normal.[7]

TABLE 2

LENGTH (IN MM) OF THE COLEOPTILE (C) AND THE MESOCOTYL (M) OF CORN SEEDLINGS AFTER RADIATION WITH AND WITHOUT AUXIN TREATMENT. AVERAGES OF ABOUT 40 PLANTS (81007), (80924).

	Time of exposure (sec)	Auxin concentration per cent.	Time after radiation (hours) 24 C	24 M	48 C	48 M	72 C	72 M
Radiated, no auxin applied	20	..	11.2	13.0	20.3	30.8	...	...
	30	..	...	...	...	...	40.7	35.6
Not radiated, no auxin applied	..	..	13.3	17.2	26.2	39.8	45.9	53.0
Radiated, auxin applied	20	.02	12.8	25.0	20.0	50.3	...	...
	30	1.0[6]	...	...	...	...	53.3	45.6

From these results it follows that, at least under the condition of our experiments, the effect of ultra-short radio waves on young corn seedlings can be accounted for as a heat effect.

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BIO-ELECTRIC POTENTIALS OF THE HEN'S EGG

THE possibility of detection of vital activity of the blastoderm of fertile eggs by physical means was suggested by Waller.[1] Also it was tried by Vorontzov and Serguijevski[2] to measure the electrical potential through the shell, between the top and the bottom of the egg on the equatorial plane. They observed that 3 to 4 hours incubated eggs gave an electro-potential difference of about 0.5 millivolt and 20 hours' incubation about 1.0 millivolt. But fresh eggs were almost isopotential, or electro-potentials were very small. Owing to that fact it is still a question whether there is a difference in electrical potentials in fresh fertile and infertile eggs. In an attempt to answer that question the present study of bio-electric potentials of the opened hens' eggs was undertaken.

The procedure followed was to apply a pair of physiological saline solution capillary electrodes to the opened egg. One electrode was touching the albumen several millimeters beyond the yolk, while the other electrode successively was placed on the top of the yolk in contact with points at various distances from the center of the blastoderm. To insure more intimate contact on the exposed surface of the yolk, the albuminous sac of the thick middle layer was ruptured and moved aside.

Potential differences existing between the electrodes were measured by a vacuum tube microvoltmeter similar to one described by Burr, Lane and Nims.[3] However, the circuit used by us was somewhat modified from that of Burr *et al.* A duotriode 6C8G tube was used with a pair of parallel filament resistances forming the grid biases close to floating grid potentials to partially offset A battery fluctuations. The input grid was brought accurately to floating grid potential by an additional C battery potentiometer control and the input was then applied across 10 megohms between the grid and ground.

[5] J. van Overbeek, *Plant Physiol.*, 13: 587–598, 1938.

[6] An indoleacetic acid concentration of 1 per cent. turned out to be too high, causing the internodes to swell rather than to elongate.

[7] Both control plants and experimental plants were exposed to light when brought in the radiation room. The reduction in growth caused by exposure to light is also offset by auxin application.

[1] A. Waller, "Signs of Life." London, 1903.

[2] B. S. Vorontsov and M. V. Serguijevski, "L'electrophysiologie de l'oeuf de poule." Probleme der Tierzsucht No. 6, Moscow, 1933 (in Russian).

[3] H. C. Burr, C. T. Lane and L. F. Nims, *Yale Jour. Biol. and Med.*, 9: 65–76, 1936.

The electrodes proper were of Ag-AgCl prepared as described by Brown[4] and were constant to several microvolts during a run. The capillary electrodes were so arranged that fresh saline solution formed the contact for each measurement. Checks of the inherent electrode potential differences were made before and after each reading.

The sensitivity of the voltmeter and electrodes was slightly above 100,000 mm/volt with a wall galvanometer. Measurements were made inside a wire screen cage to reduce pick-up disturbances. Room temperature varied less than 2° F. from day to day. Fresh eggs having been collected from the nests in the morning were brought into the room and allowed to come to room temperature for at least four hours before being measured. Several groups of measurements were delayed until the following day and were found somewhat higher than those made on the day the eggs were collected.

The incubated eggs were measured immediately after having been removed from the incubator and opened. While being measured the eggs were close to the incubating temperature, which was maintained by a thermostatically controlled enclosure.

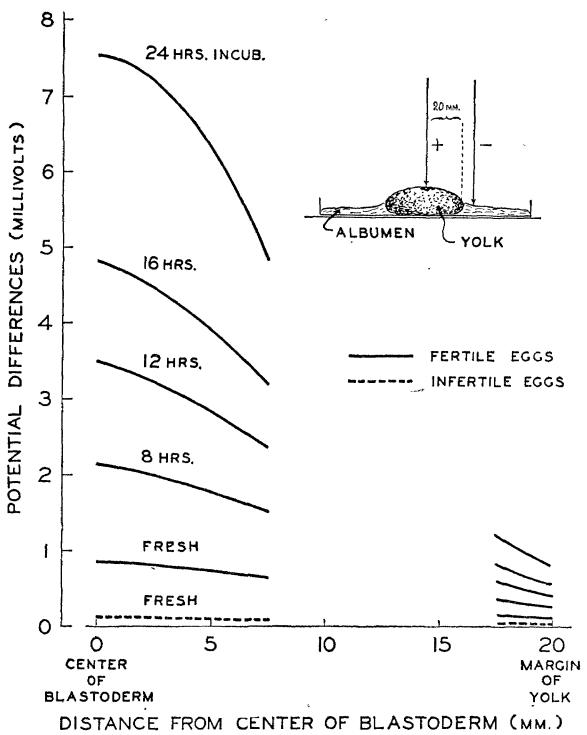

FIG. 1. The general trend of electrical potential differences of fresh and incubated eggs. One electrode was touching the albumen, while the other electrode was in contact with yolk at various distances from the center of the blastoderm.

[4] A. S. Brown, *Jour. Am. Chem. Soc.*, 56: 646–647, 1934.

The results of these observations are graphically shown in Fig. 1. There was evident an increase in potential differences with incubation, which was several times greater than through the shell.[2] On the same egg the differences decreased as the contact was moved away from the blastoderm, though some differences were still indicated at the margin of the yolk.

Most significantly in these measurements differences in electrical potential were found between fertile and infertile fresh eggs. Fertile eggs showed on an average of about 0.8 millivolt difference in potential, while with infertile eggs the difference averaged less than 0.2 millivolt.

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IMPLANTS OF EMBRYONIC TISSUE INHIBIT PARTURITION IN THE RAT

MASAO[1] described a tumor-like teratoma which he produced in mice by the inoculation of embryonic tissue. Histologically these tumors appeared to be identical with naturally occurring teratomata. The writer has subjected numerous albino rats to this procedure in the last two years. The production of these artificial teratomata is very simple. Rat fetuses about 18 days old were crushed fine enough so that the tissues could be passed through a gauge 18 hypodermic needle. A little mammalian ringer solution was added, and about 2 cubic centimeters of this material was injected into the visceral cavity. Care was taken to complete the operation as rapidly as possible. So far the embryonic tissue implanted in this manner has continued to grow in every instance. The rate of growth is rather slow. A weight of 3 to 12 grams has been attained at the end of one year.

Recently seven females 11 months of age which had carried these teratomata for six months were bred to a normal male. Their response was normal in every way except that parturition was inhibited. The fetuses developed normally, attaining the maximum size which the placentae allow and then died unless removed by hysterotomy. This experiment has been repeated on a group of ten females, and the same results were obtained.

It has been noted, however, that the implant of embryonic tissue must have had time to develop to a certain degree before parturition is completely inhibited. One rat with this implant present was able with difficulty to achieve the birth of her young. The same animal six weeks later was unable to evacuate the uterus. At the latter period the implant of embryonic tissue weighed 1.1 grams.

[1] *Jap. Jour. Cancer Res.*, 22: 28, 1928.