results are best obtained with a dosage of 0.6 g of thyroid gland per kg of body weight. It is known that the amount of vitamin B_1 in rat tissues is reduced by thyroid feeding,[10, 11] and that the thyroid-fed rat also requires more of the vitamin B_2 complex than is supplied in a normal diet.[7] We have found this same dietary relationship to be present in the dog.[12] This indicates that the abnormal liver functions in the thyroid-fed dogs are related to an increased requirement for some of the B vitamins, with a probable loss in body stores, as judged by the loss of appetite. This will be reported later in greater detail. A subnormal amount of the B vitamins in the diet may be at least partially responsible for the abnormal liver function that is observed in human hyperthyroidism.

The results of these experiments do not mean that the B vitamins are the only factors related to the production of abnormal liver function in hyperthyroid animals. However, this is the first causal relationship to be established for the production of abnormal liver function in hyperthyroidism. It is not yet known if a large amount of yeast in the diet can maintain a normal liver function in thyroid-fed dogs over a long period of time. Further experiments are in progress.

Conclusions. 1. Using a standard diet, with yeast of a known vitamin content, the liver functions of dogs was studied at two levels of thyroid feeding. 2. The production of the abnormal liver function in hyperthyroid dogs bears a causal relationship to the yeast in the diet.

11229

X-radiation and Growth Substances as Affecting Plant Primordial Tissues.

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Since little attention has been given to the primordial regions of plants as influenced by X-radiation and chemical growth-promoting substances the author has carried out experiments to determine effects of these agencies on growing points. Snow[1] observed that hetero-

10 Drill, V. A., *Am. J. Physiol.*, 1938, **122**, 486.

11 Peters, R. A., and Rossiter, R. J., *Biochem. J.*, 1939, **33**, 1140.

12 Drill, V. A., unpublished work.

* University Scholar in Biology.

1 Snow, M. and R., *New Phytologist*, 1937, **36**, 1.

auxin applied to the growing regions of certain plants caused union of leaf primordia, and Bausor[2] describes the development of root primordia on stems, petioles, and apical meristem when these parts are treated with beta-naphthoxyacetic acid.

In the present study, seedlings of sunflower *(Helianthus annuus)*, zinnia *(Zinnia elegans)*, and tomato *(Lycopersicum esculentum)* were given moderate X-ray doses (2300 to 2500 r-units for sunflower and zinnia and up to 3000 r-units for tomato). Plants were stunted, and showed rough, warty, and abnormally-shaped leaves, with fasciation of leaves and of stems and frequent fusion of leaf primordia, as previously reported by Johnson.[3] Often, a few weeks after treatment, the meristematic region was divided into 2 or 3 parts, each with a separate group of primordial leaves, showing that the stem was about to branch. Indole-3-acetic acid (0.5 to 1.0%) applied in lanolin paste to seedlings of the above-named species caused increased growth, and with higher concentrations (2%), a fusion of leaves. The meristematic area either resembles that of untreated controls, or various leaf primordia may become joined, or else displaced from normal position. Colchicine (0.5%) applied also in lanolin paste, was found to retard growth, and it induced development of rough, warty, and misshapen leaves just as X-radiation does, while short,

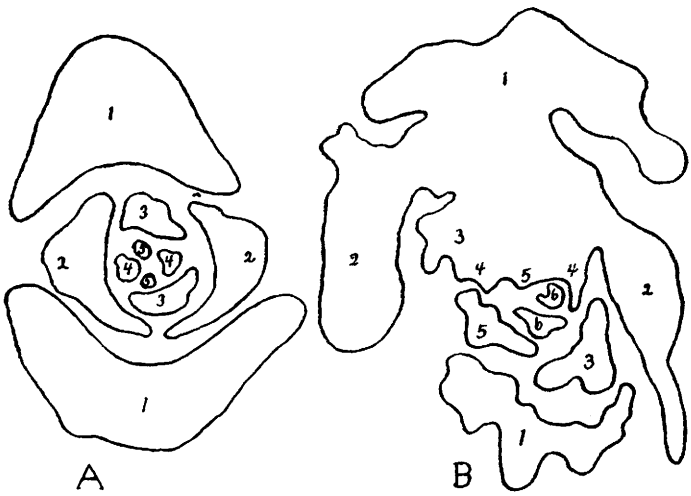

FIG. 1.

Cross sections through primordial regions of sunflower stem. A, control; B, 3 weeks after treatment with beta-naphthoxyacetic acid. Note the distorted and fused primordia. (Numbers on the diagrams indicate leaf pairs.)

[2] Bausor, S. C., *Am. J. Botany*, 1939, **26**, 733.

[3] Johnson, E. L., *Plant Physiology*, 1936, **11**, 319.

TABLE I.
Effects of 2% beta-naphthoxyacetic acid upon sunflower, zinnia, and tomato. (Results given as percentage of plants affected.)

Effects noted	Sunflower	Zinnia	Tomato
Stunted growth	100	100	97
Branching	45	53	25
Distorted leaves	100	100	100
Disturbed phyllotaxy	84	88	86
Fusion of leaves or of leaf segments	89	90	88
Fusion of primordia	75	89	83
Displaced primordia	70	74	70
Splitting of apex	25	33	30
Fasciation	30	34	30

malformed leaf primordia are also produced. The effects of alpha-naphthoxyacetic acid and of beta-naphthoxyacetic acid are similar to the effects of colchicine, but usually less pronounced. The beta form is more potent than the alpha, and since little has been published concerning its action on plants a figure and table are here introduced to describe it.

In general, beta-naphthoxyacetic acid and the other chemicals used in this study are found to produce results upon primordial plant tissues similar to the effects of X-radiation.

11230 P

Droplet Infection of Air: High-speed Photography of Droplet Production by Sneezing.*

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The question of infection of air by droplets given off in coughing and sneezing has received considerable attention during the last few years. In particular, investigation has been directed towards determining the rôle of the air-borne droplet nuclei which result from the evaporation of droplets proper. The bacteriological and epidemiological aspects have recently been discussed by Wells, Wells, and Mudd.[1] Experimentally, little is known of certain of the characteristics of such droplets—their number, size, velocity, settling rate, and rate of

* Contribution No. 163 from the Department of Biology and Public Health.

1 Wells, W. F., Wells, W. W., and Mudd, S., *Am. J. Pub. Health*, 1939, **29**, 863.