it appears unlikely that its effect on blood pressure is mediated by adrenalin.

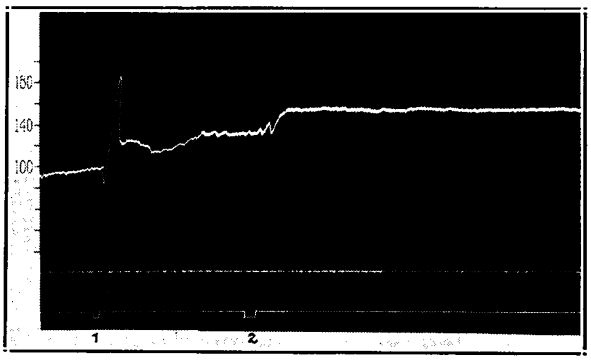

FIG. 1. Effect on cats' blood pressure of injection of extract of cerebral ventricular fluid from a patient suffering from malignant hypertension. No. 1. Extract equivalent to 4 cc of ventricular fluid. No. 2. Extract equivalent to 10 cc of blood plasma of same patient. Time marker = 10 seconds.

Pressor substance from ventricular fluid resembles that from plasma in many respects, but its concentration or potency is far greater. Quantitative aspects of it in relation to hypertension will soon be reported.

Ventricular fluids from five cases of malignant hypertension, one case of hypertension associated with adrenal carcinoma and three cases of nephritis with hypertension have been examined. All were found to contain pressor substance. Fluid obtained at operation from the lateral ventricles of a patient suffering from epilepsy with hydrocephalus, and one with a cerebral tumor, yielded extracts which were inactive. Ventricular fluid from a patient with normal blood pressure who died as the result of a gun-shot wound contained but moderate amounts. Spinal fluid but rarely contains it in high concentration.

Assay of the potency of extracts is difficult on account of dependence on the functional intactness of the central nervous system for the response. Sufficient numbers of ventricular fluids from patients suffering from different diseases have not as yet been examined to furnish grounds for claim that this pressor substance is always associated with hypertension.

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EFFECTS OF ETHYLENE ON PLANT GROWTH HORMONE

HETEROAUXIN, or plant growth hormone (β-indolylacetic acid) is known to have several effects on plants, including promotion of stem elongation, inhibition of bud growth, stimulation of root formation, production of stem swellings and stimulation of epinastic movements of the leaves. With the exception of the first two, ethylene gas also has these effects.

According to A. E. Hitchcock, ethylene, heteroauxin and other substances all act in essentially the same way.[1] This conclusion is based, apparently, on the similarity of the effects of ethylene to those of heteroauxin. There are many cases, however, where these two substances do not have the same effect.

For instance, heteroauxin increases the growth rate of *Avena coleoptiles,* and the amount of increase is dependent on the amount of heteroauxin supplied.[2] If ethylene has the same effect, it should increase the growth rate, and the degree of increase should depend on the concentration of the ethylene. However, four groups of Avena seedlings were placed for twenty-four hours in, respectively, air, 0.001 per cent. ethylene, 0.2 per cent. ethylene and 2 per cent. ethylene. The rate of growth in all three of the groups treated with ethylene was approximately the same, and was about 30 per cent. less than the rate of growth of the controls. It thus appears that, in this case, ethylene could not have acted in the same manner as a growth hormone.

It is well known also that heteroauxin increases the number of roots formed by pea cuttings.[3] These cuttings can take up enough hormone to give maximum root formation when placed inversely in a solution of hormone for twelve hours. However, when they were placed for twenty-four hours in an atmosphere containing ethylene (whether treated with hormone or not), root formation was not affected.

Cuttings of *Salix* were also used for tests on the effect of ethylene. The experiments described here were performed in May. The cuttings were of second-year wood and about eighteen centimeters long. Four groups of cuttings were treated in different ways, as follows: (1) controls, (2) 0.1 per cent. ethylene for two weeks, (3) heteroauxin applied to the top of the cutting in the form of lanoline paste,[4] (4) treated both with heteroauxin and 0.1 per cent. ethylene. The roots were counted two weeks after the experiment was

Method of treatment	Average number of roots per cutting	Increase over controls caused by treatment
Controls	11.9 ± 0.6	
Ethylene	16.2 ± 1.2	4.3
Heteroauxin	23.1 ± 1.5	11.2
Ethylene and heteroauxin	40.5 ± 2.3	28.6

[1] Contributions from Boyce Thompson Institute, 7: 1, 87, 1935.

[2] F. W. Went, *Botanical Review,* I: 162, May, 1935.

[3] Proceedings, Koninklijke Akademie van Wetenschappen te Amsterdam, XXXVII: 7, 445, 1934.

[4] The lanoline paste contained one part of heteroauxin to two thousand of lanoline.

begun. Following are some data obtained from these experiments. The average number of roots per cutting is given, with the probable error.

It seems impossible to explain these results on the theory that ethylene acts in the same manner as a growth hormone. It will be seen that the ethylene alone increases the number of roots by 4.3, and the heteroauxin alone increases it by 11.2. If the ethylene acts in the manner of a growth hormone, the ethylene and heteroauxin together could not increase the number of roots by more than 15.5, or the sum of the two preceding figures. Nevertheless, in this experiment the increase was not 15.5 or less, but 28.6. It appears, therefore, that ethylene can not be acting directly to stimulate root formation, but that it must in some way cause the growth hormone to become more active.

In none of the above experiments can the ethylene have acted in the same manner as a growth hormone. It seems probable, therefore, that all the effects of ethylene on growth are to be explained, not as direct effects of ethylene alone, but as effects of ethylene on a growth hormone.[5]

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THE ANTISCORBUTIC VALUE OF DANDELION[1]

RECENTLY two studies[2,4] appeared in SCIENCE concerning the chemical composition of dandelion and its value as a food. Bennett[2] has shown that dandelion contains large amounts of protein, fat and little fiber. It contains much more calcium and phosphorus than either lettuce, cabbage leaves, mangold leaves or spinach. According to Sherman,[3] however, there is much less calcium in dandelion than in the above-mentioned vegetables, and Youngburg[4] finds the phosphorus to be much lower. We were especially interested in the vitamin C content of dandelion and have determined it by three different methods: (1) Titration by the oxidation-reduction indicator, 2,6-dichlorobenzenone indophenol; (2) the authors' enzymic method[5]; (3) animal assay, using guinea-pigs as experimental animals. Analysis by both chemical methods has shown that the ascorbic acid content of dandelion varies between 0.08 and 0.10 mg per g of fresh greens. The animal experiments have shown that 10 gms of the plant are necessary for proper growth and the prevention of loss of weight and the development of scurvy, when using the basal diet of La Mer, Campbell and Sherman.[6] Our experiments show that the ascorbic acid content of dandelion is about 0.1 mg per gm, which is only 1/6 to 1/10 of that of spinach and is much less than that of cabbage. The minimum protective dose of ascorbic acid for guinea pigs, when macroscopic evidence is considered, is 0.9 mg per animal per day, according to Birch and associates.[7] This figure is probably more nearly correct than the one of 0.5 mg given by Göthlin.[8]

For comparison we are showing the vitamin C content[9] of the greens of parsnips, parsley and turnips (Table I). Some of these are quite rich in this ingredient.

TABLE I

	Ascorbic acid mg per g
Dandelion, greens	0.08–0.10
Spinach, fresh	0.92–1.0
Cabbage, new[10]	0.40
Parsley, greens	1.4 –1.8
Parsnips, "	2.10–2.16
Turnips, "	1.1 –1.2
Beets, "	0.36–4.0

Thus, although dandelion contains more protein, fat, carbohydrates, iron and ash than some other leafy foods, it is not a good source of vitamin C.

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5 This is also in agreement with the work of van der Laan. "Also sind bei Avena die Beschädigungen, die durch Aethylengas verursacht werden, auf eine Hemmung der Wuchsstoffbildung zurückzuführen." Recueil des travaux botanique néerlandais, XXXI: 733, 1934.

1 This investigation was aided by a grant from the Committee on Scientific Research, American Medical Association.

2 Bennett, SCIENCE, 80: 142, 1934.

3 Sherman, "Food Products," third edition, The Macmillan Company, New York, 1933.

4 Youngburg, SCIENCE, 80: 338, 1934.

5 Tauber and Kleiner, *Jour. Biol. Chem.*, 110: 559, 1935.

6 La Mer, Campbell and Sherman, *Jour. Am. Chem. Soc.*, 44: 165, 1922.

7 Birch, Harris and Ray, *Biochem. Jour.*, 27, 590, 1933.

8 Göthlin, *Nature*, 134: 569, 1934.

9 Tauber and Kleiner, *Jour. Biol. Chem.*, 108: 563, 1935.

10 Bessey and King, *Jour. Biol. Chem.*, 103: 687, 1933.

BOOKS RECEIVED

CHALK, L. and others. *Fifteen South African High Forest Timber Trees. Vol. III of Forest Trees and Timbers of the British Empire.* Pp. 103. Illustrated. Oxford University Press. $2.50.

HERRICK, GLENN W. *Insect Enemies of Shade-Trees.* Pp. viii + 417. 321 figures. Comstock, Ithaca, N. Y. $5.00.

JONES, H. SPENCER. *Worlds without End.* Pp. xv + 329. 32 plates. Macmillan. $3.00.

SCHMIDT, HARRY. *Einführung in die Vektor- und Tensorrechnung unter besonderer Berücksichtigung ihrer physikalischen Bedeutung.* Pp. v + 125. 20 figures. Max Jänecke, Leipzig. 5.80 RM.

SUTHERLAND, G. B. B. M. *Infra-Red and Raman Spectra.* Pp. xi + 112. 27 figures. Methuen, London. 3/-.

WALSH, J. L. *Interpolation and Approximation by Rational Functions in the Complex Domain. Vol. XX of Colloquium Publications.* Pp. ix + 382. American Mathematical Society.