TABLE I.
Comparison of Electro-encephalographic and Pneumo-encephalographic Findings in 9 Schizophrenic Patients.

Patient	Electro-encephalogram	Pneumo-encephalogram
H.A.	++	++
C.B.	+	+
I.B.	—	+
A.B.	+	++
M.C.	—	—
J.D.	—	—
E.D.	+	+
G.H.	++	++
B.M.	—	—

\+ Limited to small area (usually parietal or posterior part of frontal).
++ Extensive.
— No atrophy.

tients, but a sufficient number were secured to allow comparison with the electro-encephalographic localizations (Table I). In all cases the electro-encephalographic diagnoses were made before the pneumo-encephalograms were taken.

It is interesting that slow, "pathological" potentials, usually associated was brain lesions,[4] were observed only in the 2 patients who had the most marked cortical atrophy.

Summary. It was found possible to localize atrophy of the cerebral cortex in schizophrenic patients by comparing the alpha (10 per second) rhythms of the various regions of the two hemispheres with each other. The findings were confirmed by pneumo-encephalography in 8 out of 9 patients.

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Simplified Rations for Guinea Pigs Suitable for Assay of the Grass Juice Factor.*

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Previous publications from this laboratory have described studies

[4] Walter, W. G., *Proc. Roy. Soc. Med.*, 1937, **30**, 579; Williams, D., and Gibbs, F. A., *N. E. J. Med.*, 1938, **218**, 998.

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on the grass juice factor in which both rats[1, 2] and guinea pigs[3] have been used for assay purposes. The basal ration used for each of the species was mineralized winter milk. Since certain laboratories have difficulty in obtaining milk from cows fed rations known to be deficient in the grass juice factor, we were interested in developing a purified ration which could be used in place of the milk. This paper gives a preliminary account of the results obtained when dry rations designed to be low in the grass juice factor were used for guinea pigs.

The following rations were used:

	P-1	P-2	P-3	P-4	P-5
Dextrin	70	69	59	59	59
Casein (Labco)	18	18	18	—	—
Casein (crude)	—	—	—	18	18
Salts 1	4	4	4	4	4
Brewer's yeast (Pabst)	4	6	6	6	6
92% alcohol soluble liver extract	1	—	—	—	—
Cottonseed oil	2	2	2	2	—
Cod liver oil	1	1	1	1	1
Snowdrift	—	—	5	5	—
Butter fat	—	—	5	5	—
Lard	—	—	—	—	12

The diet and water were supplied *ad libitum*. Each guinea pig was given 2 cc of orange juice daily to supply the vitamin C requirement. The above diets invariably maintain rats in good condition although these animals may show lower than normal rates of growth depending upon previous history. However, when guinea pigs weighing 300-450 g were placed on any one of these rations, death occurred in 3 to 10 weeks. Among the symptoms observed prior to death were severe loss in body weight, muscular atony and weakness, thinning of the hair coat, and stiffening of the joints. In some cases head retraction was noted immediately preceding death. Autopsy showed no signs of rickets or scurvy. In some cases darkened areas on the lungs were observed, suggesting that the animals in their enfeebled condition had contracted pulmonary pneumonia which probably was the terminal cause of death. In many of the animals, however, the stomach linings were found to contain numerous petechial hemorrhages, accompanied in most cases by hemorrhagic ulcers. In some cases these hemorrhages were apparently severe enough to cause death, and in such animals no evidences of pneumonia could be seen.

1 Kohler, G. O., Elvehjem, C. A., and Hart, E. B., *Science*, 1936, **83**, 445.
2 Kohler, G. O., Elvehjem, C. A., and Hart, E. B., *J. Nutr.*, 1937, **14**, 131.
3 Kohler, G. O., Elvehjem, C. A., and Hart, E. B., *J. Nutr.*, 1938, **15**, 445

The addition of dried grass† to the ration P-1 at a level of 5% had little or no beneficial effect on any of the symptoms described. Ten percent of the grass produced a temporary increase in weight, but after about 3 or 4 weeks the animals stopped growing, began to lose weight, and finally died. When 20% of grass was fed, still greater improvement resulted. Extremely variable growth was obtained in guinea pigs receiving rations P-1, P-2, and P-3. However, those receiving ration P-4 or P-5 supplemented with 20% of grass grew at a rate of 4.5 to 5.5 g per day over a period of 8 weeks. Autoclaving the grass for one hour at 15 pounds pressure completely destroyed the growth-promoting activity.

In several cases animals receiving 20% of unautoclaved grass suddenly sickened during rapid growth, and died after losing much weight during the following 2 or 3 days. Autopsy showed severe stomach ulcers. Further, one of the animals, which had grown to maturity at a normal rate while receiving ration P-4 plus 20% of grass, began to lose weight rapidly after 15 weeks on this ration. He finally died with severe stomach ulcers. These observations, together with the fact that guinea pigs receiving a milk diet deficient in the grass juice factor show no stomach ulcers, suggest that the basal dry rations used are deficient in at least 2 nutritional factors, namely, the grass juice factor and a factor associated with the maintenance of a normal stomach lining. Grass supplies plenty of the former, but is low in the latter. Since it has been shown that cholic acid and chondroitin prevent gizzard lesions in the chick,[4, 5] these compounds were fed as supplements to ration P-4 at levels of 0.5 and 3.0% respectively. Severe stomach hemorrhages and ulcers were obtained in guinea pigs receiving these supplements. Hence it must be concluded that the guinea pig stomach ulcer factor is distinct from the chick gizzard factor. In spite of the complicating effect of the stomach ulcers, ration P-5 may be used with considerable success for the assay of the grass juice factor if care is taken to associate sudden losses in weight with the presence of stomach ulcers, which can be verified upon autopsy. A few typical results are shown in Chart 1.

It is evident from these results that 2 nutritional factors may be studied through the use of guinea pigs maintained on purified diets

† We are indebted to Mr. L. H. Smith and Dr. W. R. Graham, Jr., of the Cerophyl Laboratories, Division of American Dairies, Kansas City, for generous supplies of dehydrated cereal grasses (Cerophyl).

4 Bird, H. R., Oleson, J. J., Elvehjem, C. A., and Hart, E. B., *J. Biol. Chem.*, in press.

5 Almquist, H. J., and Mecchi, E., *J. Biol. Chem.*, 1938, **126**, 407.

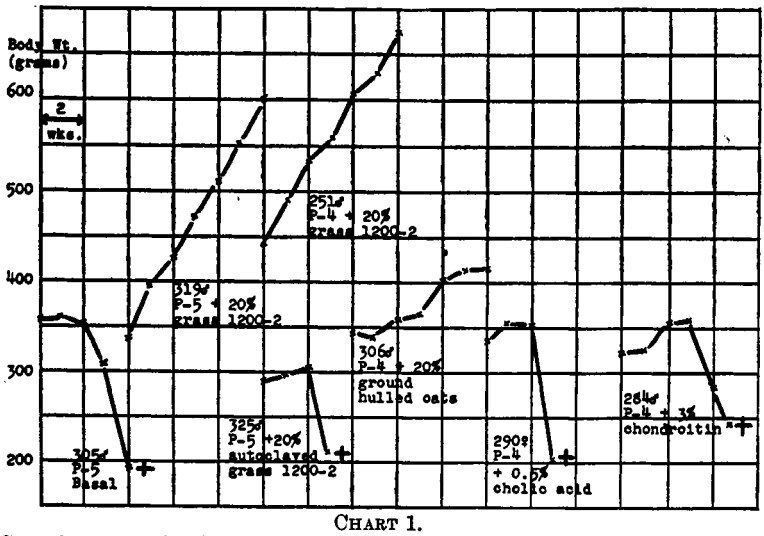

CHART 1.

Growth curves of guinea pigs fed rations P-4 and P-5 plus various supplements. Pigs 284, 290, and 305 showed severe stomach ulcers upon autopsy.

such as P-4 and P-5. The growth-promoting factor is undoubtedly the grass juice factor and is supplied from properly prepared young grass. In this connection it is interesting to refer to a paper by Wulzen and Bahrs[6] which was called to our attention by Dr. Ira Manville. These workers describe a condition in guinea pigs very similar to the deficiency of the grass juice factor which can be prevented by fresh kale or fresh alfalfa.

The second factor, which may be called the stomach ulcer factor, may not be supplied in adequate amounts by 20% of grass. It is apparently present in fair amounts in grains since guinea pigs have been kept on ration P-5 plus 20% ground hulled oats for 15 weeks with no indication of stomach ulcers.

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Effect of Gelatine on Muscular Fatigue.

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It has been reported by Boothby[1] that the onset of muscular

[6] Wulzen, R., and Bahrs, A. M., *Physiol. Zool.*, 1936, **9**, 508.

[1] Boothby, W. M., *Proc. Mayo Clin. Staff Meetings*, 1934, **9**, 600.